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ABSTRACT

This three-part guide presents a brief program description along with lists of performance objectives and lists of test items for the Des Moines (Iowa) Public Schools Title I Elementary Mathematics Program. The program description provides background information on the Des Moines Public School District and describes the student selection/screening process, the instructional process, and the parent-school-communication process used in the program. The performance objectives section presents objectives for kindergarten through eighth grade for the following ten strands: (1) measurement; (2) logic and sets; (3) numeration; (4) addition-subtraction; (5) multiplication-division; (6) rational numbers; (7) geometry; (8) decimal fractions; (9) proportion and percent; and (10) probability. This section also includes an objectives hierarchy chart which divides the K-8 sequence into 29 steps and lists the objectives for each strand that should be taught at each step. The test items section offers test items which are keyed to the performance objectives for each strand with the exception of the probability strand. (DC)

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EDUCATIONAL PLAN

TITLE I MATHEMATICS

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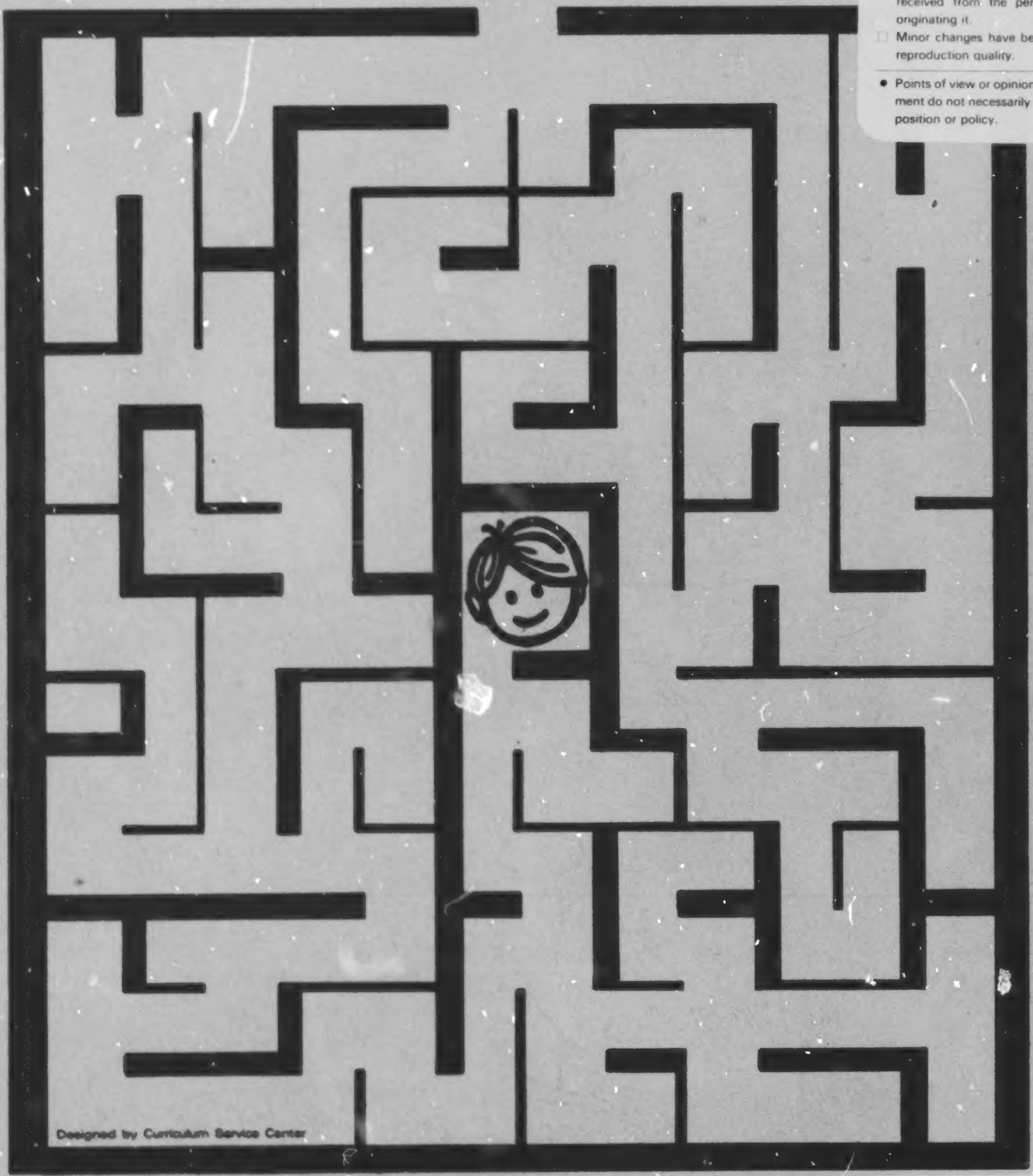
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DES MOINES INDEPENDENT COMMUNITY SCHOOL DISTRICT
1800 Grand Avenue
Des Moines, Iowa 50307

Educational Plan
Title I Elementary Mathematics Program
Description, Performance Objectives and Tests

Revised
1979

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DESCRIPTION

ELEMENTARY MATHEMATICS EDUCATIONAL PLAN

1979

MATHEMATICS EDUCATIONAL PLAN

I. General Information

The Des Moines Public School District serves the city of Des Moines, Iowa, plus contiguous areas in Windsor Heights, Pleasant Hill, and Warren County, but does not serve other suburbs in the metropolitan area. Des Moines is the capital and largest city in Iowa. It is an industrial, commercial, insurance, and financial center of the state.

Located in the Des Moines' inner city are areas of economic need in which a number of defined neighborhood development plans are operating. Minority students make up 14.90% of the district's total enrollment of 20,800, but the minority elementary school population was concentrated in seven elementary school attendance areas. During 1977-78 the district implemented a desegregation plan to correct this imbalance.

Significant numbers of students in target area schools have been achieving below grade level in mathematics as measured by the Iowa Tests of Basic Skills and the Metropolitan Achievement Test. One goal of the District has been to bring these children to grade level in mathematics. The Title I, ESEA mathematics project in operation for the past seven year, has had reasonable success in this effort.

Schools are chosen for service under a combination formula which selects those with the highest number of and those with the highest percentage of free and reduced price lunches. A staff of 25 resource teachers and 1 coordinator will serve these schools.

During the 1979-80 school year students will be selected under a two-phase procedure.

Phase 1

All students in Title I schools will be tested on a locally developed and administered criterion-referenced test. Students in grades 1-6 will take the test appropriate for their grade level. The following scores will be used as criteria to select students in greatest need:

Grade	Cut-off Criteria
1	17 correct or less
2	32 correct or less
3	31 correct or less
4	34 correct or less
5	34 correct or less
6	33 correct or less

Those students who have participated in this project in a previous year and who have made gains but who are still below the level expected for children of their age, will be eligible for selection on the locally developed criterion test based on the following criteria:

Grade	Cut-off Criteria
1	18 correct or less
2	33 correct or less
3	32 correct or less
4	35 correct or less
5	35 correct or less
6	34 correct or less

Phase 2

A second test, Key Math, will be given upon recommendation of Title I teacher (s) or classroom teacher (s) to students for whom professional staff question the ranking of the scores on the Mathematics Test for Performance Objectives. Students may be qualified for service or may be eliminated from consideration based on the following criteria:

Grade	Cut-off Criteria
1	below 0.8 grade equivalent
2	1.5 grade equivalent or below
3	2.2 grade equivalent or below
4	3.0 grade equivalent or below
5	4.0 grade equivalent or below
6	5.0 grade equivalent or below

Many of those students eligible for Title I will not be selected for Title I services because the numbers of eligible students are far greater than the spaces available with the present staff and federal allocation. Title I mathematics teachers will select those students who have the greatest need as indicated by their test scores.

The order of priority for remedial assistance in Title I will be students in grade 2, followed by those in grade 3, 4, 1, 5, and 6.

A needs assessment checklist will show reasons for any student not selected for service. Reasons for skipping a student includes:

1. His/her grade level does not have high priority.
2. Formal and informal testing data indicate the student's performance is close to his/her actual grade placement.
3. School scheduling conflicts make it impossible to have the student in the Title I classroom the necessary time for effective remediation.
4. The Title I teacher's class load has been filled by students having greater need.
5. The parent requested that the student not be served by the Title I program.
6. The educational needs are being met by other special programs.

All of the foregoing phases of student selection will be reviewed and approved in each Title I school by the Title I Math Coordinator.

Students who are eligible for service but who cannot be served because of space limitations will be placed on a waiting list. When space becomes available, they will be selected for service according to the stated priorities. Students who move into a school after the service has begun will be tested and placed on the waiting list according to their scores and grade level priority.

II. Instructional Process

A. Organizational structure of project

Each teacher may serve a maximum number of 40 students. Participating students will receive instruction from the project teacher in groups of about 5 for time periods equal to about half of the regular math period. This instruction may take place in the classroom, in an appropriate designated area, or in a math lab.

B. Diagnosis

The project teacher(s) will maintain an individual educational plan in a student record folder for each student selected for service. This plan will be based on the Des Moines set of K-8 mathematics objectives. The teachers will diagnose the student's needs from the assessment test, the strand placement items, and any other diagnostic tests which are administered by the by the teacher.

C. Prescription

The skills and concepts to be emphasized are itemized in the K-8 Mathematics Objectives, Des Moines Public Schools. These objectives are divided into strands and arranged in a hierarchy of skills. The strands emphasized in the program are measurement, numeration, addition-subtraction, and multiplication-division.

Objectives are listed in the pupil record folders in the suggested teaching order which is outlined in the hierarchy of skills. However, teachers may vary instruction to meet individual student needs and to correlate the student's program with the regular classroom mathematics program.

D. Theories underlying the Instruction

The basic theory underlying the program is that the participating students are capable of attaining mathematical concepts and skills. The Title I teacher assesses the students' strengths and weaknesses, teaches to the strengths and remediates the weaknesses.

The instructional techniques are based on the learning theories of Piaget, Dienes, and others. Children learn in different ways in different periods of cognitive development. In general, Piaget suggests that the child between the ages of seven and eleven years is in the period of concrete operations. At various times during this period the child attains conservation of number, mass, distance, and volume. In other words, these attributes of objects remain invariant even when the child's perception might indicate a change. The child must achieve conservation of these attributes before concepts involving them can be learned. For example, teaching a child to add 2+3 is meaningless if the child thinks the number of objects spread out is greater than it is when the same set is condensed in spatial arrangement.

During the period of concrete operations the child's logical thought is based on the physical manipulation of objects. She/he cannot yet reason abstractly. Therefore, project teachers introduce and develop skills with concrete objects, and these objects are manipulated by the children rather than being manipulated solely by the teacher, so that the children can test their own theories This method allows the child to assimilate and accommodate the concept within his/her own cognitive framework.

Dienes points out a principle of multiple embodiment: each concept should be presented in as many different ways as possible. Acting on this principle, Title I teachers use a variety of materials, and they accompany and follow concrete materials with appropriate lessons at the representational and reinforcement levels.

E. Materials

The following chart shows materials used to teach at the concrete and representational levels.

Levels of Instruction	Concrete	Representational
STRANDS		
Measurement		
Money	Real and play money	Money stamps
Time	Real and play clocks	Clock stamp Calendar
Temperature		Thermometer
Dozen	Egg Cartons	
Linear	Cuisenaire rods Dienes blocks Measuring sticks, Non-standard English Metric Trundle wheel	
Area	Tiles Tangrams	Graph paper Geoboards
Volume	Cube blocks Containers, Metric and English Measure	
Graphs	Blocks Tiles	Graph paper
Mass	Scales and weights	
Logic and Sets	Attribute blocks Objects and counters Beads Venn diagram materials	Pattern cards
Numeration	Unifex blocks Dienes blocks Bean sticks Ice cream sticks	Graph paper set Hundreds board Place value chart Multibase stamp Abacus Poker chips Money
Addition-Subtraction	Counters Unifex blocks Ice cream sticks Bean sticks Dienes Blocks	Numberline Pictures

Levels of Instruction	Concrete	Representational
Multiplication-Division	Counters Tiles Dienes blocks	Dot Arrays Graph Paper
Rational Numbers	Paper folding Counters Cuisenaire rods Flannel board and felt pieces	Graph paper
Geometry	Attribute, shape blocks Geometric solids (and patterns) Tangrams Geoboards Mira Math Compass Protractor	String designs

In addition to these materials, the teachers use a wide variety of teacher-made worksheets which are keyed to appropriate objectives at the representational level and teacher-made games at the reinforcement level. Also used in many strands for reinforcement are flashcards, learning stations, commercial kits, records, tapes, filmstrips, films, electric boards, and puzzles.

F. Evaluation

Teachers use various diagnostic tests, questioning to determine thinking processes, and observation of the child's actions with manipulatives to check mastery of objectives. Sample test items for each objective in the K-8 set are available. These test items will be the chief evaluation instrument used by teachers to check individual children's progress.

Evaluation of the project is done by the Evaluation Department of the Des Moines Public Schools. Each identified student will be tested with the appropriate Metropolitan Achievement Test in October and April. These tests will be used to evaluate the following student performance objectives:

(1) Students (grades 1-8) enrolled in the program a minimum of four months will exhibit knowledge of mathematics concepts and computation by mastering 80% of the objectives to which they have been introduced.

(2) At the end of the instruction year, Title I students (grades 1-8) enrolled in the mathematics program for a minimum of four months will demonstrate an increase in the mean percentile rank from pre- to post-test on the mathematics test of the Metropolitan Achievement Survey Battery (1978).

(3) At the end of the instruction year, first grade Title I students enrolled in the mathematics program at least four months will demonstrate proficiency in mathematics by attaining scores on the mathematics test of the Metropolitan Achievement Survey Battery such that
   (a) 25% of the students achieve a percentile rank of 56% or above,

   (b) no more than 25% of the students will achieve a percentile rank of less than the twenty-second percentile,

   (c) The average score will be equivalent to at least the forty-second percentile.

(4) At the end of the instruction year Title I students (grades 1-8) enrolled in the mathematics program for at least four months will demonstrate a proficiency on the Mathematics Test of the Metropolitan Achievement Survey Battery such that

   (a) at least 25% will show an NCE gain of at least 10.0 NCE scores,

   (b) no more than 25% of the students will show an NCE gain of less than 1,

   (c) the average gain by grade in NCE's will be at least 7

III. Parent School Communication Process

The Des Moines Public School System has a district-wide Title I Parent Advisory Council with parents of the children in the programs forming a majority of the committee. The Council participates in the planning, development, operation and evaluation of the district's Title I program. Each Title I school has elected parents or community members as representatives for the Advisory Council.

The major effort to communicate with parents and to secure their participation in the program is done by project teacher initiated personal contacts. First, a letter is sent informing the parents of their child's identification for the program. The letter is followed by home visits and by invitations to visit the child's Title I class.

During the first semester 1979-80 project teachers will make home visits to the parents of at least 65% of the students served. They will inform the parents about their child's progress, ask for suggestions about ways the child learns best, and discuss the individualized educational plans.

Parents are also invited to conferences and workshops where they are given suggestions about ways to help their child at home.

MATHEMATICS (K-8) PERFORMANCE OBJECTIVES

Revised
1979

Generally proceed step-by-step from left to right. However, many variations are possible. Steps	I Measurement	II Logic and Sets	III Numeration	IV Addition-Subtraction	V Multiplication Division	VI Rational Numbers	VII Geometry	VIII Decimals	IX Proportion Percent	X Probability
	Suggested K-8 Hierarchy Chart for Mathematics									
1. K*	1-12	1-8								
2. K	13-28						1-7			
3. K	29-34						8-13			
4. K	35-42		a-d							
5. A		9-15	1	1-8			14-15			
6. A	43-44		3-13	9-12	1-5					
7. A	45-52		14-19	13-14	6-12	1-2	16-19			
8. B		16-18	20-22	14a-16		2a-6	20-22			
9. B	53-59		23-26	17-33	12a-22					
10. B	60-72		27-38	34-41	23-26		23-25			
11. C	73-79	19	39-41			7	26			
12. C	80-89		42-54	42-47	27-47					
13. C	90-99	20		48-70	48-54	8	27			
14. C	100-102		55-56	72-79	55-61	9	28-43		1	
15. D	103-112	21	57-62	80-82	62-68	10-14	44-55			
16. D	112a-114		63-68	83-88	69-87	15-19	56-63		2	
17. D	115-120		69-70		88-93	20-22	64-68		3	
18. E	121-125	22	71-73			23	69-71			1
19. E	126-139	23	74-79	89-90	94-104	24-25	72-79	1-15	4	
20. E	140-150	24-25	80-81	91-93	105-112	26-32	80-86	16-19		
21. F	151-155	26-28	82-85	94	113-115	33-39		20-21	5	2
22. F	156-160	29	86-89		116-123	40-49	87-94	22-25		
23. F	161-169				124-127	50-56	95-100	26-30	8-9	
24. G	170-190	30-31		95-97		57-59	101-113	31-33	10-13	3
25. G	191-193, 195-197			98	128-133	61-62	114-119	34-37	14-21	4-5
26. G	194, 198-202	32-36		98-101	134-137	63-64	120-123	38-44	22-25	6-7
27. H	203		90-91	102-110	138-146		124-128	45		
28. H	205-208		92-93		147-150	65	129-133	46-47		
29. H	204, 209-222	37-44	94-98	111-113	151-154	66-70	134-137	48-50		8-13

* "K" represents objectives often studied in the kindergarten, "A" those found in the first grade, etc. However, this should not delimit either a child or a teacher.

MEASUREMENT STRAND

I. Measurement Strand

The learner can indicate understanding of the following size, shape, or quantity relationships of objects or sets of objects:

K-1 big(ger)(gest)/little(r)(st)

K-2 long(er)(est)/short(er)(est)

K-3 tall(er)(est)/short(er)(est)

K-4 large(r)(st)/small(er)(est)

K-5 same/different

K-6 like/unlike (alike/not alike)

K-7 many(more than)/few(er)

K-8 all/none/some

K-9 heavy(ier)(iest)/light(er)(est)

K-10 most/least (number property)

K-11 less than/greater(more)than(in number)

K-12 equivalent sets (same number)

The learner can indicate understanding of the position relations:

K-13 inside/outside

K-14 top/bottom

K-15 above/below

K-16 under/over

K-17 up/down

K-18 far/near

K-19 first/last

K-20 left (of)/right (of)

K-21 high(er)(est)/low(er)(est)

K-22 in front of/behind

K-23 beside/by/next to

K-24 close to/away from

K-25 row/column

K-26 middle

K-27 between

K-28 around

The learner can indicate understanding of the time and temperature relations:

K-29 beginning/end (of an event)

K-30 before/after (an event)

K-31 early(ier)(iest)/late(r)(st)

K-32 young(er)(est)/old(er)(est)

K-33 hot(ter)(test)/cold(er)(est)

K-34 cool(er)(est)/warm(er)(est)

Measurement Strand

The learner can:

K-35 define "money" as "buys things" or as "pennies, nickels, dimes," etc.

K-36 identify and orally name pennies, nickels, dimes, and their comparative values.

K-37 define "clock" as "tells the time" or "when to do things," etc.

K-38 correctly use the terms "morning," "noon," "afternoon," "evening," "night," "week" and "day" to respond to questions such as: "When does the sun rise?", "When do you eat lunch?"

K-39 define "calendar" as "tells the day, week, month, and year."

K-40 define "thermometer" as "tells the temperature" or "tells how hot/cold it is."

K-41 compare lengths of similar rods (e.g., Cuisenaire, etc.) and say, "It takes _____ of these to make one of these." ($\leq$ 10)

K-42 read a 12-hour clock to the nearest hour.

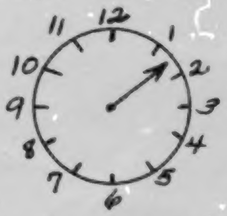
A-43 identify 1¢, 5¢, 10¢, 25¢, 50¢, and $1 coins and bill.

A-44 name the total value of a set of pennies, nickels, dimes, $\leq$ 25¢.

A-45 solve story problems about money to 25¢, stated orally or pictorially.

A-46 identify one dozen and one-half dozen objects.

A-47 state that it is "after _____ o'clock" and "before _____ o'clock" when presented with a clock face with only the hour hand.



Example: "It is after 1-o'clock and before 2-o'clock."

A-48 read a 12-hour clock to the nearest half hour.

A-49 read the names of the months and days of the week from a calendar.

A-50 name the day of the week (today) and the month, and identify it on a calendar.

A-51 order/arrange similar objects according to some property such as size, length, weight, etc., to 10 objects.

A-52 perform crude measurements with unmarked sticks and report the measure as "more than _____ sticks," less than _____ sticks," etc.

B-53 make and use a ruler with divisions showing whole units (their choice).

B-54 identify a meter stick (100 rod) as a unit of measure and how to use it.

Measurement Strand

B-55 identify a penny, nickel, dime, quarter, half-dollar, dollar, and can state the value of each (except penny) in terms of the lower units.

B-56 name the total value in pennies, $\leq$ \$1, of a set of U.S. coins.

B-57 identify two non-identical sets of coins of the same value $\leq$ \$1.

B-58 write/name, to the nearest degree the temperature indicated by a thermometer (C or F), including "below zero" values.

B-59 read a 12-hour clock to the nearest fifteen minutes.

B-60 name the calendar year (this year).

B-61 name the days of the week in order, orally and in writing.

B-62 name the calendar months in order, orally and in writing.

B-63 identify the correct calendar date for any given day and month.

B-64 describe the relationship of hours to days, weeks to months, seasons to a year.

B-65 distinguish which of two containers holds the greater volume.

B-66 identify pints and quarts and compare these measures.

B-67 identify a liter and compare it (approximately) to a quart.

B-68 distinguish "heavier" and "lighter" objects with an equal-arm balance.

B-69 compare the areas of two plane regions by superposition.

B-70 complete simple number sentences involving measurement skills to this point, from pictorial or orally stated problems.

B-71 construct a graph, using blocks or pictures of objects, to compare the number of boys and girls in school, etc.

B-72 read the values represented by the graph in B-71.

C-73 name the number of feet in a yard, inches in a foot/yard.

C-74 name the number of decimeters in a meter, centimeters in a meter/decimeter.

C-75 measure objects $\leq$ 5 meters to the nearest meter/yard.

C-76 measure objects $\leq$ 1 meter long to the nearest foot/decimeter.

C-77 measure objects $\leq$ 30 centimeters long to the nearest inch/centimeter.

C-78 draw a segment ($<$ 20 cm) to the nearest centimeter/inch.

C-79 measure objects $<$ 10 meters long to the nearest ½-inch/½-centimeter.

C-80 name the number of inches in $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$ of one, two, or three feet using a ruler or yard-stick.

Measurement Strand

C-81 name the number of centimeters in $\frac{1}{2}, \frac{1}{4}, \frac{1}{5}, \frac{1}{10}$ meter using a meterstick.

C-82 estimate the length of common objects ($<$ 100cm) to the nearest 3 inches or 10 centimeters.

C-83 compare linear, area, and volume measurement.

C-84 determine the total value $\leq$ \$10 of a set of U.S. coins and dollar bills.

C-85 make change for any purchase $<$ \$1, given $\leq$ \$1.

C-86 make change for any purchase $<$ \$5, given $\leq$ \$5.

C-87 use the decimal point and \$ in reading and writing money values for \$.10, \$.25, \$1.00, \$1.50, etc.

C-88 determine the number of hours/minutes before or after a particular event or stated time.

C-89 read a 12-hour clock to the nearest minute.

C-90 add/subtract simple measures: money, length, and time.

C-91 measure (approx.) the area of a rectangular region by "tiling," or by counting squares in a grid overlay.

C-92 measure (approx.) the volume of a rectangular prism region by counting the number of unit cubes it contains.

C-93 measure liquids to the nearest cup, pint, quart, gallon.

C-94 name the number of deciliters in a liter and measure liquids to the nearest deciliter.

C-95 weigh objects to the nearest ounce/gram with an equal-arm balance.

C-96 state the number of ounces in $\frac{1}{2}$ or $\frac{1}{4}$ of a pound and grams in a kilogram.

C-97 measure his/her own weight to the nearest pound/kilogram.

C-98 write and solve number sentences presented pictorially/orally involving measurement skills to this point.

C-99 write and solve number sentences for worded problems involving measurement skills to this point.

C-100 construct a bar graph from a simple frequency distribution (e.g., outdoor temperatures for each hour of the day).

C-101 correctly read values from the bar graph of C-100.

C-102 extrapolate from a simple bar graph to formulate predictions.

D-103 read and write the time indicated by a 12-hour clock, to the nearest minute (e.g., 12:08 P.M.).

Measurement Strand

D-104	identify: decade, century, millennium.
D-105	name the number of days in a leap-year and a non leap-year.
D-106	name the number of days in each month of the year, including the February variations.
D-107	determine the total value in decimal notation of a pictured or actual collection of U.S. coins and bills ≤ $20.
D-108	make change for any purchase <$10, given ≤ $10.
D-109	add/subtract money values, sums to < $20.
D-110	name the number of inches in a foot and in a yard, feet in a yard and in a mile.
D-111	name the number of millimeters in a centimeter, centimeters in a meter, meters in a kilometer.
D-111a	**approximate the length of a pencil, room, golf club, etc., in cm/m.**
D-112	select an "appropriate" unit to measure the length of a given object.
D-112a	measure to the nearest ¼"/½ cm.
D113	name the perimeter of a physical model of a polygon by measuring, and when given the length of each side.
D-114	measure (approx.) the areas of triangular regions, regular and irregular polygonal regions, and curved regions, by "tiling" or by counting squares in a grid overlay.
D-115	name the number of milliliters in a liter/deciliter.
D-116	measure liquid volume to the nearest milliliter/ounce.
D-117	measure mass (weight) to the nearest ½-pound/gram.
D-118	write number sentences for and can solve one or two-step worded problems involving measurement skills to this point.
D-119	place in tabular and bar graph form the information secured from a survey (e.g., number of students vs. eye color).
D-120	read the values from a graph, as in D-119
E-121	read and record time to the nearest second (e.g., 5:15:03 P.M.).
E-122	name the number of minutes in a given number of hours ≤ 12 hours.
E-123	name the number of seconds in a given number of minutes ≤ 1 hour.
E-124	name the number of hours, minutes, and seconds between two given times ≤ 6 hours.
E-125	tell what the time will be __ hours, __ minutes, and __ seconds from now.

Measurement Strand

E-126 identify the last and the next leap-years and explain the necessity for leap-year.

E-127 convert units of time (min., hrs., days, wks., mos.) to both the next lower and the next higher unit of measure (e.g.: 6 weeks → 42 days, $1\frac{1}{2}$ months).

E-128 write the number of days between given pairs of dates.

E-129 convert any of the units, inches, feet, yards, miles to any other of these units.

E-130 convert millimeters, centimeters, decimeters, meters, kilometers, to any other of these units.

E-131 measure objects ≤ 20 meters long to the nearest millimeter/$\frac{1}{8}$ inch. Write metric measure as 3.54m, etc.

E-132 estimate the length of common items to the nearest appropriate unit (English and Metric) so the measure used is ≥ 1.

E-133 make change for any purchase $<$ \$20, given $\leq$ \$20.

E-134 define "area."

E-135 determine the area of a given rectangular region (no formula).

E-136 determine the area of given quadrangular regions (no formula) and select appropriate units of measurement.

E-137 estimate, then checks, the area of given 2-D regions.

E-138 identify the radius and the diameter of a circle and their comparative lengths.

E-139 name the number of quarts and pints in a gallon.

E-140 add or subtract like measures of length, time, and money, each containing two or more units (e.g., 3 hrs., 5 min., 10 sec.) and write the result in simplest form.

E-141 determine the volume of a "box" (prism), no formula.

E-142 define "volume."

E-143 estimate the volume of prism, using appropriate units.

E-144 measure mass to the nearest ounce/gram.

E-144a estimate the mass of common items to the nearest appropriate unit (English/Metric) so the measure used is ≥ 1.

E-145 name the approximate relationships of a mile to kilometers, a yard to a meter, a quart to a liter, pounds to a kilogram.

E-146 construct simple line graphs, label them, then explain what the graph shows (e.g., outside temperatures day to day).

E-147 read simple bar or line graphs to obtain specific information (e.g., the temperature at 2 P.M. on Dec. 5, 1974).

Measurement Strand

E-148 use a protractor to measure a plane angle to the nearest degree.

E-149 compute the average (mean) of two to ten like measurements.

E-150 write number sentences for and can solve one to two-step worded problems involving measurement skills to this point.

F-151 measure objects $\leq$ 50 meters long to the nearest $\frac{1}{16}$ inch/millimeter. Write metric measure as 4.567m, etc.

F-152 rank a list of three to five like (e.g. length) measurements from the most precise to the least precise (unit used and decimal value).

F-153 rename measurements (linear, area, volume, mass, time, money) which are mixed numbers ($1\frac{1}{2}$ ft., etc.), in terms of the next higher and the next lower unit of measure, both English and Metric.

F-153a estimate the temperature of their surroundings, using F or C.

F-154 draw bar, circle, line, and simple pictographs to represent appropriate sets of data.

F-155 obtain requested information from the graphs in F-154.

F-156 compute the area of rectangular regions, using $A = l.w$.

F-157 compute the volume of rectangular prisms, using $V = l.w.h$.

F-158 determine the missing element in the formula $A = l.w$ and $V = l.w.h$, given all but one element.

F-160 multiply/divide measures of time, money, length, area, volume, and mass by numbers $\leq$ 10, and write the result in simplest form.

F-161 define mass.

F-162 recognize that all measurement involves approximation (is not exact). Uses the symbol $\approx$.

F-163 obtain requested information from tables of values (e.g., square root tables, air and rail time schedules).

F-164 use a protractor to determine the sum of the measures of the angles of a polygon (3-6 sides) to the nearest five degrees.

F-165 name the measure of one member of a linear pair of angles (adjacent supplementary angles) given the measure of the other member.

F-165a define circumference of a circle.

F-166 name the ratio ($\pi \approx 3.14$) of the circumference and the diameter of a circle, following appropriate wxperimentation.

F-167 state and use the rule ($C = \pi d$) to find the circumference of a circle, knowing its radius or diameter.

Measurement Strand

F-168 write number sentences for and can solve two or three-step worded problems involving measurement skills and concepts to this point.

F-169 judge the reasonableness of answers to computational problems by approximation.

G-170 write at least three factual statements derived from examining the data on a picture graph.

G-171 construct a picture graph indicating the relationship of at least two variables from a given set of data.

G-172 (Same as G-170 adapted to a bar graph.)

G-173 (Same as G-171 adapted to a bar graph.)

G-174 (Same as G-170 adapted to a broken line graph.)

G-175 (Same as G-171 adapted to a broken line graph.)

G-176 (Same as G-170 adapted to a circle graph.)

G-177 (Same as G-171 adapted to a circle graph.)

G-178 compute the mean (central tendency) from (1) a given set of data, and (2) by using the data represented by a bar graph.

G-179 compute the median (central tendency) from (1) a given set of data, and (2) by using the data represented by a bar graph.

G-180 compute the mode (central tendency) from (1) a given set of data, and (2) by using the data represented by a bar graph.

G-181 compute the range from (1) a given set of data, and (2) by using the data represented by a bar graph.

G-182 know the numerical meaning of the metric prefixes: mega, kilo, hecto, deka, deci, centi, milli, micro.

G-183 convert any metric measure (linear, mass, volume) to a higher or lower unit, with emphasis on kilo, deci, centi and milli.

G-184 name the lengths represented by a simple scale drawing.

G-185 construct a scale drawing of a simple object, building, or site.

G-186 estimate and can determine distances from simple maps with conversion factors given.

G-187 use a protractor to determine (approximately) the sum of the measures of the angles of a(ny) plane triangle. Accepts 180° for this value.

G-188 compute the measure of the third angle of a triangle, given the measures of two angles of the triangle.

Measurement Strand

G-189 read and interpret electric, gas, and water utility meters.

G-190 compute utility bills from given cost-per-unit data and two successive readings.

G-191 use the d = rt (distance equals rate times time) relationship, knowing two of the variables, to solve related problems.

G-192 compute the circumference of a physical model of a circle, or when given the measure of its radius or diameter.

G-193 compute the measure of the radius or diameter of a circle, given the measure of its circumference.

G-194 use the Pythagorean Theorem to find the length of one side of a right triangle, given the measures of the other two sides.

G-195 compute the area of a physical model of a triangle, or when given the measure of the base and the height. Can apply $A = \frac{1}{2}bh$.

G-196 compute the measure of the base or height of a triangle, given its area and the measure of the base or the height, using $A = \frac{1}{2}bh$.

G-197 compute the area of each of a set of physical models of parallelograms (including rectangles, squares, and rhombuses), or when given sufficient measurements to apply $A = bh$.

G-198 compute the area for each of a set of physical models of trapezoids, or when given sufficient measurements to apply $A = \frac{1}{2}h\ (b_1 + b_2)$.

G-199 compute the area of a physical model of a circle, or when given the measure of the radius or diameter can apply $A = \pi r^2$.

G-200 write number sentences for and can solve two- and three-step worded problems involving measurement skills and concepts to this point.

G-201 compute the surface area of a right rectangular prism.

G-202 compute the volume of a right rectangular prism.

H-203 use similar triangles and proportions to solve simple indirect measurement problems.

H-204 apply the Pythagorean Theorem to solve reasonably difficult worded problems involving right triangles.

H-205 compute the missing simple interest, principal, rate, or time in a problem involving money use or investment.

H-206 compute the interest on D dollars at a rate R for two to five years, interest compounded yearly.

Measurement Strand

H-207 compute business problems involving discount, net price, profit, rate of increase or decrease, commission, taxes, or list price.

H-208 write number sentences for and can solve two- and three-step worded problems involving measurement skills and concepts to this point.

H-209 compute the lateral area and total area of a physical model, or given sufficient data, of a right circular cylinder.

H210 compute the volume of a physical model, or given sufficient data, of a right circular cylinder by using $V = Bh$.

H-211 compute the surface area of a physical model, or given sufficient data, of a regular pyramid.

H-212 compute the volume of a physical model, or given sufficient data, of a regular pyramid by using $V = \frac{1}{3}Bh$.

H-213 compute the surface area of a physical model, or given sufficient data, of a right circular cone by using $S = \frac{1}{2} \cdot s \cdot C + B$.

H-214 compute the volume of a physical model, or given sufficient data, of a right circular cone by using $V = \frac{1}{3} Bh$.

H-215 compute the surface area of a physical model, or given the radius or diameter, of a sphere by using $S = 4\pi r^2$.

H-216 compute the volume of a physical model, or given the radius or diameter, of a sphere by using $V = \frac{4}{3}\pi r^3$.

H-217 describe "a degree of longitude."

H-218 describe "a degree of latitude."

H-219 locate a point on a model (globe) of the Earth's surface, given its latitude and longitude.

H220 name the local standard time of each time zone in the continental U.S., given a Greenwich time.

H-221 explain why each time zone contains approximately 15° of latitude.

H-222 name the local standard time of arrival for a plane flight anyplace on Earth, given the starting point, the hours enroute, and a globe with time zones marked.

Logic and Sets Strand

II. Logic and Sets Strand

The learner can:

K-1 reproduce (copy) a simple pattern of objects (ababab···, aabbaabbaabb···, abcabcabc···, abcdabcdabcd···, etc.).

K-2 complete/extend a simple incomplete linear pattern of objects.

K-3 form subsets of sets of objects (plastic cars, etc.) on the basis of size, form, color, class or function.

K-4 form a one-to-one correspondence of two equivalent complementary sets (straws to milk containers, etc.) $\leq$ 10 in each set. (Teacher: "is there a straw for each milk carton?")

K-5 form a one-to-one correspondence of two equivalent sets of the same type of objects (big balls and smaller balls, etc.), $\leq$ 10 in each set.

K-6 form a one-to-one correspondence of two equivalent diverse sets of objects, $\leq$ 10 in each set.

K-7 form a set of objects $\leq$ 10 equivalent to a given set. (Teacher arranges the given set in a variety of configurations for the student to match.)

K-8 indicate which of two non-equivalent sets of objects $\leq$ 10, arranged in a variety of configurations, has the greatest/least number of objects (and how many more or less). (Allow the students to use one-to-one correspondence.)

A-9 form a set of objects having exactly one more member than a given set $\leq$ 9.

A-10 form a set of objects having exactly one less member than a given set $\leq$ 10.

A-11 name the number property of a set of $\leq$ 10 objects and recognizes that it remains constant as the teacher changes the set's configuration---conservation of number. (Teacher: "Is the number more than, the same as, or less than before?")

A-12 name the number property of a set of $\leq$ 10 objects, then can state that the total number is the same when the set is separated into two subsets. (Conservation of number.)

Logic and Sets Strand

A-13 place sets of objects in sequence from least to greatest number, given sets of one, two, three, ···, ten members.

A-14 identify, without counting, sets of one to five objects.

A-15 select a set of objects ≤10 having 2, or 3 common attributes (properties), as requested by the teacher. (e.g.: red squares; thin, blue triangles; small, thick, red squares, etc.)

B-16 place sets of objects in sequence from least to greatest number, given sets of one, two, three, ..., twenty-five members.

B-17 complete simple number patterns (e.g.: 1,2,3,__,__: 2,4, 6 __,__; 12,__,__,__,16,__,__,__; 1, 1, 2, 2, 3, 3, __, __.)

B-18 describe the common property(ies) of a given set of ≤ 10 attribute blocks.

C-19 complete simple number patterns applicable at this level. (e.g.: 3, 6, 9, __, __; 5, 10, 15, __, __; 27, 25, 23, __, __.)

C-20 classify (arrange in specified subsets) sets of ≤ 20 objects, using two to four properties simultaneously: color, size, shape, weight, function, numerousness, etc.

D-21 complete simple number patterns applicable at this level. (e.g.: 2, 4, 6, 10, __, __; 15, 14, 12, 9, __, __.)

E-22 complete simple number patterns applicable at this level. (e.g.: 1, 2, 4, 8, __, __; 5, 8, 6, 9, 7, __, __.)

E-23 correctly use the relations "Right-of", "Left-of","brother-of", etc.

E-24 complete "because" statements logically (e.g.:) "Half of the number 9 is not 4 because...," "Half of the number 8 is 4 because..."

E-25 complete "therefore" statements (the inverse of "because") logically (e.g.: "3 plus 3 is 6, therefore...," "The grass is wet, therefore...")

F-26 complete simple number patterns applicable at this level. (e.g.: 3, 4, 6, 7, 9, __, __; 64, 32, 16, __, __, __.)

F-27 use Venn diagrams to describe the intersection of two finite sets of numbers.

Logic and Sets Strand

F-28 use Venn diagrams to describe the union of two finite sets of numbers.

F-29 refute listed false statement by citing a counter example (contradiction).

G-30 list all subsets of a given finite (≤ 10) set, including the empty set.

G-31 correctly identify and use the set notation symbols: $\{\}$, $\in$, $\cup$, $\cap$, $\subset$.

G-32 explain logically why an "If---then" statement is true or false.

G-33 demonstrate syllogistic logic using a simple "If---then" statement. (e.g.: "If it is wood, then it is breakable. My pencil is made of wood, therefore it can break.")

G-34 match set algebra statements with their correct Venn diagram representations.

G-35 complete number patterns such as the Fibonacci sequence and those in Pascal's triangle, etc.

G-36 read and follow the directions listed in a simple flow chart.

H-37 write the converse of an "If---then" statement and list its truth value.

H-38 write the inverse of an "If---then" statement and list its truth value. Compare with the truth value of the original statement.

H-39 write the contrapositive of an "if---then" statement and list its truth value. Compate with the truth value of the original statement.

H-40 recognize that a statement and its converse or inverse do not always have the same truth value (same: if one is true, the other is true--or if one is false, the other is also false).

H-41 recognize that a statement and its contrapositive do have the same truth value.

H-42 detect and describe flaws and fallacies in advertising and propaganda where statistical data and inferences are employed.

Logic and Sets Strand

H-43 draw valid conclusions involving application of deductive reasoning, from a given set of information. (Gather and present data to support an inference or argument.)

H-44 identify and/or describe the Axioms of Equality: Reflexive $(a = a)$, Symmetric $(a = b \leftrightarrow b = a)$, and Transitive $(a = b, b = c, \longrightarrow a = c.)$

Numeration Strand

III. Numeration Strand

The learner can:

K-a name any numeral 0-6 and can form a set of counters with that number property.

K-b orally name and select the correct numeral 0-6, given a set of counters in various configurations.

K-c name any numeral 7-12 and can form a set of counters with that number property.

K-d orally name and select the correct numeral 7-12, given a set of counters in various configurations.

A-1 name and write the numeral indicating the number property of a given set of objects $\leq$ 10, including zero, arranged in a variety of configurations.

A-3 build a set of 10 and 1, 10 and 2, ..., 10 and 9, as the teacher states and writes the 'teen' numerals.

A-4 name and write the numeral for given physical models of 11-19.

A-5 write any numeral(s) 0-20 in random order or in sequence as dictated by the teacher.

A-6 rename a given numeral 11-19, using 10+1, 10+2, ..., 10+9.

A-7 arrange a set of numeral cards 0-20 in order.

A-8 indicate which of two different given numerals 0-20 represents the greater or the lesser number.

A-9 name the ordinal number of each object (1st, 2nd, 3rd, etc.) in a given set of $\leq$20 objects arranged in a line.

A-10 name orally and select the numeral indicating the number property of a set of $\leq$20 objects and of the sets formed when one or more objects is (are) separated from the original set.

A-11 name orally and select the numerals indicating the number property of each of two separate sets and of the join ($\leq$10) of these sets.

A-12 name and write the numeral for the number between any two given consecutive odd or even numbers $\leq$20.

A-13 name and write the numerals n + 1 and n - 1, where n is 1-19.

A-14 form 1-9 sets of ten objects and name the number of tens.

A-15 select the correct number of models of ten (bundles of sticks, beansticks, etc.) to represent a given numeral: 10, 20, 30, ..., 90.

A-16 write the numeral denoting given models of 10, 20, 30, ..., 90.

A-17 count orally by ones through 100 (to illustrate the numeration pattern.)

Numeration Strand

A-18 use $<$ or $>$ to express the relationship (in a number sentence) of any two different numbers ≤ 20, and can read this statement orally.

A-19 orally read the word names for the numbers "zero" through "twenty," and can write the numerals representing these words.

B-20 form a physical model, using sets of 10's and 1's, to represent any 2-digit numeral.

B-21 identify the number property of and write the numeral for sets of 20 to 100 objects (counting hopefully by twos, fives, or tens.)

B-22 orally read the ordered set of numbers ≤ 100, with random starting point.

B-23 count to 100 by tens, starting with ten. (Try starting with 1, 2, etc.)

B-24 count to 50 by twos, starting with one or two.

B-25 count to 100 by fives, starting with five. (Try starting with 1, 2, etc.)

B-26 count to 30 by threes, starting with three. (Try starting with 1, 2.)

B-27 write the numeral for any number ≤ 100, given the word name orally or written.

B-28 write the word name of any number ≤ 100, and can read it orally.

B-29 write the numeral and orally name the positive number that is one or ten more or less than any number ≤ 99.

B-30 name and write the numeral for the number between any two consecutive odd or even numbers ≤ 100.

B-31 write in sequence (order) any subset of numbers ≤ 100.

B-32 name the place value of each digit in any numeral 10-100.

B-33 rename any numeral 11-99 in expanded notation (e.g. $89 = 80 + 9$).

B-33a give the standard name for the expanded form of any numeral 11-99.

B-34 use $<$ or $>$ to write and to state orally the relationship (in a number sentence) of any two different numbers ≤ 100.

B-35 identify odd and even numbers ≤ 100.

B-36 write the ordinal name (first, second, third, etc.) for the position of any object(s) in a line, ≤ 20.

B-37 write the Arabic numeral denoted by the Roman numerals I - XII, and conversely.

B-38 label given points of a number line with the integers -20 to $+20$.

C-39 relate orally and in writing the numeral to the physical model for any given number 100-999.

Numeration Strand

C-40 count to 200 by ones, starting with 100.

C-41 count to 200 by tens.

C-42 name orally and in writing the place value of each digit in the numerals 11-999.

C-43 rename any numeral 100-999 in expanded notation.

C-44 state orally the word name for any numeral ≤1000.

C-45 select the correct number of models of tens and ones to represent any numeral 10-200.

C-46 identify all odd and even numbers ≤1000.

C-47 count to 1000 by one-hundreds, starting with 100.

C-48 write the numeral for any number from 100 to 1000, given the word name orally or written.

C-49 write the word name for any number ≤1000, given the numeral.

C-50 round-off any numeral 10-999 to the nearest ten.

C-51 use <, or, > to express the relationship (in a number sentence) of any two different numbers ≤1000.

C-52 arrange in sequence any subset of numerals ≤ 1000.

C-53 write the numeral and orally name the positive number that is one, ten, or 100 more or less then any number ≤999.

C-54 name the whole number between any two consecutive odd or even numbers ≤1000.

C-55 write the Arabic numeral denoted by the Roman numerals I - XX, and conversely.

C-56 write the standard (simplest) name for an expression containing parentheses (e.g. (3 x 2) + 5 = ☐).

D-57 count to 10,000 by thousands.

D-58 count to 10,000 by one-hundreds.

D-59 write the numeral for any number from 1000 to 10,000, given its word name.

D-60 orally read and can write the word name for any number 10,000.

D-61 write the standard name for an expression containing parentheses (e.g., 3 + 4 x (5 + 6) = ☐).

D-62 order (sequence) any five numerals ≤ 10,000.

D-63 name orally and in writing the place value of each digit in the numerals 1000 - 100,000.

Numeration Strand

D-64 rename any numeral 1000 - 100,000, using expanded notation.

D-64a give the standard name for the expanded form of any numeral 1,000 - 100,000.

D-65 state the criteria for identifying an odd or an even number.

D-66 write the numeral for any number from 10,000 to 100,000, given its word name.

D-67 orally read and can write the word name for any number from 10,000 to 100,000.

D-68 "round-off" numerals 1,000 - 10,000 to the nearest 10 or 100.

D-69 identify prime numbers in the set 0-10.

D-70 identify composite numbers in the set 0-50.

E-71 count to 1,000,000 by one-hundred thousands, starting with 100,000.

E-72 name orally and in writing the place value of each digit in the numerals 11-10,000,000.

E-73 rename any numeral 100,000 - 1,000,000, using expanded notation.

E-74 orally read and can write the word name for any number $\leq$1,000,000.

E-75 write the numeral for any number $\leq$ 1,000,000, given its word name.

E-76 "round" numerals $\leq$ 1,000,000 to the nearest 1,000 or 10,000.

E-77 write and orally name the successor/predecessor of any number $\leq$ 1,000,000.

E-78 name the number between any two consecutive odd or even numbers $\leq$ 1,000,000.

E-79 use $<$, $\neq$, or $>$ to express the relationship (in a number sentence) of any two different numbers $\leq$ 1,000,000.

E-80 identify prime numbers $\leq$ 100.

E-81 identify composite numbers $\leq$ 100.

F-82 name the set $\{0, 1, 2, 3, \ldots\}$, and given the name "whole numbers" can use the above set notation to describe it.

F-83 name the elements of well defined sets. (e.g.; The set of even numbers less than ten is $E = \{2, 4, 6, 8\}$.)

F-84 use negative numbers to describe appropriate situations (temperature, bank balance, motion, etc.)

F-85 use $<$, $\neq$, or $>$ to show the relationship of any pair of different integers from $^{-}100$ to $^{+}100$.

F-86 write the numeral for any given number $\leq$ 1-billion, given its word name.

F-87 write the word names for and orally read any numeral $\leq$ 1,000,000,000.

Numeration Strand

F-88 name orally and in writing the place value of each digit in the numerals 11 - 1,000,000,000.

F-89 recognize that there is no greatest number.

H-90 identify and can write examples of a finite set of numbers (including the empty set.).

H-91 identify and can write examples of an infinite set of numbers.

H-92 draw a hierarchy "tree" or Venn diagrams expressing the relationships of the following sets of numbers, and describe each set: whole numbers, integers, rational numbers and real numbers.

H-93 match the Roman numerals I-XX, L, C, D, M with the equivalent Hindu-Arabic numerals.

H-94 write the numeral, base two (or five, or eight), denoting the cardinal property of a set of ≤ 40 objects.

H-95 rename a list of five base two (or five, or eight) numerals in base ten.

H-96 use set notation to describe the intersection of: (a) the set of integers and the set of whole numbers; (b) the set of odd numbers and the set of even numbers; (c) the set of prime numbers and the set of composite numbers, (d) the set of rational numbers and the set of integers.

H-97 use set notation to describe the union of: (a) the set of even numbers and the set of odd numbers; (b) two given finite sets.

H-98 write a flow chart for determining odd and even numbers.

Addition-Subtraction Strand

IV. Addition-Subtraction Strand

In the set of whole numbers the learner can:

A-1 state orally and can write the number sentence expressing the action when one object is joined with (union of) a given set of objects ≤ 10.

A-2 state orally and can write the number sentence expressing the action when one member is separated from a given set of objects ≤ 10.

A-3 select a set of objects A to join to a given set B so the number property of the joined sets is a given number ≤ 10. Write the number sentence expressing the action.

A-4 select a set of objects to separate from a given set ≤ 10 to leave ≤ 9 objects. Write the number sentence expressing the action.

A-5 add any two numbers, sums ≤ 5. (Uses 'counting on' strategy.)

A-6 subtract any two numbers ≤ 5.

A-7 add any two numbers, sums ≤ 9. (Uses 'counting on' strategy.)

A-8 subtract any two numbers ≤ 9.

A-9 state orally and can write the number sentence expressing the joining (addition) of two disjoint sets of objects, totaling 2-20.

A-10 state orally and can write the number sentence expressing any separation (subtraction) of a given set of objects ≤ 20.

A-11 orally read, and can illustrate using objects, a given number sentence expressing addition with two addends, sum ≤ 13.

A-12 orally read, and can illustrate using objects, a given number sentence expressing subtraction using the numerals 1-13.

A-13 orally or in writing indicate the sums (≤ 20) are the same for the numbers a + b and b + a (commutative property).

A-14 correctly name the symbols +, -, =.

B-14a add 1, 2, 3, . . ., 9, to 10.

B-15 add any two numbers, 0 - 10 (vertically or horizontally).

B-15a add a two-digit and a one-digit number, no regrouping.

B-15b subtract 1, 2, 3, . . . 9, from 10. Can check results.

B-16 subtract 1-digit subtrahends from 2-digit minuends ≤ 20. Checks.

B-17 illustrate on a number line the solution of addition or subtraction problems for numbers ≤ 13, no regrouping (renaming, carrying, or borrowing).

B-18 add any three 1-digit numbers, sum ≤ 20 (vertically or horizontally).

Addition-Subtraction Strand

B-19 name several correct solutions of sentences such as $\square + \triangle = 7$ and $\square - \triangle = 11$, using numbers ≤ 20.

B-20 solve one-step worded addition or subtraction problems read aloud by the teacher, with numbers ≤ 20, using manipulatives.

B-21 name $N + 0$, $0 + N$, and $N - 0 \leq 20$.

B-22 state orally or in writing a worded problem which describes a given addition or subtraction sentence using numbers ≤ 20. (inverse of B - 20).

B-23 solve three-addend number sentences for sums ≤ 20, with parentheses enclosing a pair of the addends.

B-24 write the symbols for "plus", "minus", "is equal to."

B-25 write or orally name the number property of each of two disjoint sets of object and for the join of these sets ≤ 25.

B-26 state and can write the number sentence expressing the action in B-25.

B-27 use objects to illustrate addition sentences with two addends, sums ≤ 25.

B-28 use the number line to illustrate addition of two numbers ≤ 25.

B-29 add any two 2-digit numbers, no regrouping.

B-30 separate a specified subset from a set of ≤ 25 objects, then write or orally name the number property of the original set and of the disjoint sets.

B-31 write the number sentence expressing the action in B-29.

B-32 complete 50 different addition facts for 0-10 in 5 minutes, vertically or horizontally, with at least 95% accuracy.

B-33 complete 40 different subtraction facts for 0-10 in 5 minutes, vertically or horizontally, with at least 95% accuracy.

B-34 name the missing addend for 50 different 2-addend combinations of 0-10.

B-35 complete subtraction sentences with missing minuend, subtrahend, or difference for numbers ≤ 25, using objects if necessary.

B-36 place the correct symbols (+ or -) to form true statements such as $13 \square 5 = 8$ and $4 \square 3 < 5$.

B-37 correctly place $<$, $=$, $>$ in addition and subtraction sentences, using numbers 25. (e.g.: $15 + 4 \square 8 + 12$.)

B-38 use the number line to illustrate subtraction of two numbers 25.

B-39 subtract any 1-digit number from any 2-digit number, no regrouping.

B-40 subtract any two 2-digit numbers, no regrouping, positive difference.

Addition-Subtraction Strand

B-41 do one-step worded problems (read aloud by teacher) involving either addition or subtraction with numbers ≤ 25.

C-42 list at least three equivalent names for any number 20 - 100, using addition or subtraction.

C-43 demonstrate the inverse relationship of addition and subtraction (e.g., $7 + 6 = 13 \longrightarrow 13 - 6 = 7 \longrightarrow 13 - 7 = 6$.)

C-44 correctly complete sentences such as $3 + 2 = 8 - \square$, $\square + 5 = 8 + 7$, $8 + \square < 12$, and $4 + 9 > \square + 5$, using numbers ≤ 20 (uses objects or number line, if needed).

C-45 add any three 1-digit numbers.

C-46 add any 1-digit number to any 2-digit number ≤ 90.

C-47 subtract any 1-digit number from any 2-digit number. Checks.

C-48 add any two 2-digit numbers, sum < 100.

C-49 add any three 2-digit numbers, sum < 100.

C-50 add any two 2-digit numbers.

C-51 add any three 2-digit numbers.

C-52 subtract any two 2-digit numbers, no zeros in minuend, positive difference.

C-53 subtract any two-2-digit numbers, positive difference. Checks.

C-54 add any two 3-digit numbers, sum < 100.

C-55 add any two 3-digit numbers.

C-56 add any three 3-digit numbers.

C-57 add any two 4-digit numbers.

C-58 subtract any two 3-digit numbers, no zeros in minuend, regrouping in units place only, positive difference.

C-59 subtract any two 3-digit numbers, no zeros in minuend, regrouping in tens place only, positive difference.

C-60 subtract any two 3-digit numbers, no zeros in minuend, positive difference.

C-61 subtract any two 3-digit numbers with zero in units place only of minuend, positive difference.

C-62 subtract any two 3-digit numbers, zeros in tens place only of minuend, positive difference.

C-63 subtract any two 3-digit numbers, zeros in units and tens place of minuend, positive difference.

Addition-Subtraction Strand

C-64 subtract any two 3 or 4-digit numbers, positive difference. Checks.

C-65 identify the sum or the addends in a horizontal or a vertical arrangement of addition or subtraction.

C-66 place $<$, $=$, $>$ between two addition/subtraction expressions to form a true statement, using numbers ≤ 100.

C-67 complete sentences such as $\square + 41 = 41 + \square$ (Commutative Property of Addition).

C-68 complete sentences such as $84 = (\square + 54) = (84 + \square) + 54$ (Associative Property of Addition).

C-69 place the correct symbol ($=$, $\neq$) in sentences such as $9 - 5$
$5 - 9$, to make them true.

C-70 name N + 0, N - 0, 0 + N, for any number N. (Zero or Identify Number for Addition.)

C-72 estimate the answer to an addition or subtraction problem to the nearest ten or hundred as requested.

C-73 write and solve number sentences for one-step worded problems involving addition or subtraction, for numbers ≤ 1000.

C-74 write and solve number sentences for two-step worded problems involving addition/subtraction, for numbers ≤ 1000.

C-75 complete a 2-addend addition test of 100 items in fifteen minutes with at least 95% accuracy for the numbers 6-20.

C-76 complete a subtraction test of 100 items in fifteen minutes with at least 95% accuracy over the numbers 3-20.

C-77 supply the missing addend for two-addend number sentences, sums ≤ 200, to form true statements.

C-78 supply the missing subtrahend for subtraction sentences, minuends to 200, to form a true statement.

C-79 identify the minuend, the subtrahend, and the difference in a horizontal or vertical arrangement of subtraction.

D-80 estimate an answer to an addition or subtraction problem to the nearest hundred or thousand, as requested.

D-81 complete sets of ordered pairs, numbers ≤ 20, given a rule for addition or subtraction. (e.g.: $3 + n$, then (1,4), (2,5), etc.)

D-82 determine the rule, addition or subtraction, given a set of ordered pairs (≤ 20) determined by the rule.

D-83 write a number sentence for and solve one or two-step worded problems involving addition/subtraction with numbers ≤ 1000.

Addition-Subtraction Strand

D-84 rename (expanded notation) two numbers $\leq$10,000 to explain the addition or subtraction (positive difference) of these numbers.

D-85 add any two to five numbers $\leq$10,000.

D-87 supply the numbers missing from a sequence involving addition by a constant.

D-88 supply the numbers missing from a sequence involving subtraction by a constant.

E-89 add ten or less numbers, each $\leq$ 1,000,000.

E-90 subtract two numbers $\leq$1,000,000, positive difference.

E-91 write a number sentence for and can solve two-and three-step worded problems involving addition/subtraction of numbers $\leq$1,000,000.

E-92 state for any numbers M and N, 0-1000, that N + M = M + N.

E-93 state for any M, N, and P, 0-1000, that (N + M) + P = N + (M + P).

E-94 recognize that subtraction is not always possible (does not have the Closure Property) in the set of positive real numbers (e.g.: 7 - 10 = ?). (Do not say "We can not subtract 8 from 6", for example.)

In the set of integers the learner can:

G-95 complete 20 whole number addition exercises, 2 to 5 addends with 5 or fewer digits, in 10 minutes with at least 90% accuracy.

G-96 complete 20 whole number subtraction exercises, 5 or fewer digits, in 10 minutes with at least 90% accuracy.

G-97 complete or extend a variety of arithmetic (common difference) sequences of integers.

G-98 complete patterns similar to the following (stress consistency):

a)	b)	c)	d)	e)
7 - 5 =	7 + 3 =	7 - 3 =	$^{-}8 + 3 =$	$^{-}8 - 3 =$
7 - 6 =	7 + 2 =	7 - 2 =	$^{-}8 + 2 =$	$^{-}8 - 2 =$
7 - 7 =	7 + 1 =	7 - 1 =	$^{-}8 + 1 =$	$^{-}8 - 1 =$
7 - 8 =	7 + 0 =	7 - 0 =	$^{-}8 + 0 =$	$^{-}8 - 0 =$
7 - 9 =	$7 + {}^{-}1 =$	$7 - {}^{-}1 =$	$^{-}8 + {}^{-}1 =$	$^{-}8 - {}^{-}1 =$
7 - 10 =	$7 + {}^{-}2 =$	$7 - {}^{-}2 =$	$^{-}8 + {}^{-}2 =$	$^{-}8 - {}^{-}2 =$
7 - 11 =	$7 + {}^{-}3 =$	$7 - {}^{-}3 =$,	$^{-}8 + {}^{-}3 =$	$^{-}8 - {}^{-}3 =$

Addition-Subtraction Strand

GH-99 name the additive inverse of any integer $(A + {}^{-}A = 0)$.

GH-100 add any two integers using the number line or patterns.

GH-101 subtract any two integers using the number line or patterns.

GH-102 solve one variable number sentences over the set of integers, involving addition/subtraction.

GH-103 solve relations such as $n + 2 > 5$ and graph the solution set on a number line, for integers or real numbers, ${}^{-}20$ to +20.

GH-104 correctly use the order of operations in number phrases with addition and subtraction.

GH-105 correctly use grouping symbols in number phrases with addition and subtraction.

GH-106 write number phrases (open sentences) that correctly describe worded number statements.

GH-107 write the number sentences for and can solve 2- or 3-step worded problems over the set of integers.

GH-108 identify, properly name and apply the Commutative Property for Addition.

GH-109 identify, properly name and apply the Associative Property for Addition.

GH-110 identify, properly name and apply the Zero Property (Identity Element) for Addition.

H-111 form an addition table for a "clock-arithmetic" modulus 12 or 5.

H-112 form an addition chart in base two.

H-113 form an addition chart in base five, or base eight.

Whole Numbers: Multiplication-Division Strand

V. Multiplication-Division Strand

In the set of whole numbers the learner can:

A-1 state the number of rows and columns in a rectangular array of ≤ 12 objects, and the number property of the set (multiplication).

A-2 form a "____by____" rectangular array upon request, and can name the number property of the array, ≤12.

A-3 state "There are ____ sets of ____ each," given two or more equivalent sets of ≤12 objects or pictures of objects. (Rectangular arrays/equivalent disjoint sets.)

A-4 use ≤ 12 objects to form " ____ sets of ____ each," as directed (Rectangular arrays/equivalent disjoint sets.)

A-5 answer questions asking "How many sets of ____ each are equivalent to a set of ?" by forming sets or arrays of objects/pictures of objects, total ≤ 18.

A-6 answer orally or in writing questions such as "3 sets of 4 each = __?__ objects," or "A 3 by 4 set = __?__ objects."

A-7 match rectangular arrays representing products ≤12, to multiplication expressions such as 2 x 3 = 6.

A-8 supply = or ≠ to form true statements for multiplication expressions presented as repeated addition (e.g., 2 x 3 = 3 + 3), product ≤18).

A-9 use repeated addition to solve multiplication exercises, products ≤50.

A-10 form subsets of a given set of ≤18 objects as requested, with N in each set, then can name the number of subsets (no remainder).

A-11 separate a set of ≤18 objects into a requested number of equivalent subsets, then can name the number in each subset, and the number of remaining (extra) objects, if any.

A-12 name the number of separations ("subtraction") of equivalent subsets, with N members each, from a set of ≤ objects, with or without remainders.

B-12a complete number sentences for products ≤18, using rectangular arrays.

B-13 complete a multiplication table, products ≤18, using manipulatives.

B-14 supply the missing factor when one factor and the product ≤18, are given for a rectangular array (e.g.: ____ by 6 = 18.)

B-15 supply the missing factor in a number sentence using x and =, when one factor and the product ≤18, are given.

B-16 use ≠ and = symbols to write a true number sentence for any products ≤18 (e.g., 3 x 4 ☐15).

B-17 multiply 0, 1, 2, 3, ..., 10 by 1, orally/in writing.

Multiplication-Division Strand

B-18 multiply 0, 1, 2, 3, ···, 10, by 2, orally/in writing.

B-19 multiply 0, 1, 2, 3, ···, 10, by 3, orally/in writing.

B-20 multiply 0, 1, 2, 3, ..., 10, by 4, orally/in writing.

B-21 multiply 0, 1, 2, 3, ···, 10, by 5, orally/in writing.

B-22 multiply 0, 1, 2, 3, ···, 10, by 6, orally/in writing.

B-23 name the number of times a given factor is represented in a given product ≤ 18. (Division).

B-24 demonstrate the product of two factors 1-9, using rectangular arrays.

B-25 complete a 5 minute test for all products of 0-6, with at least 95% accuracy.

B-26 write a number sentence for and solve a simple one-step worded problem involving multiplication.

C-27 demonstrate the product of two factors 1-5, using the number line.

C-28 demonstrate division of two numbers, dividends ≤ 81, no remainder, by separation of equivalent sets or by rectangular arrays.

C-29 multiply 0, 1, 2, 3, ···, 10, by 7, orally/in writing.

C-30 multiply 0, 1, 2, 3, ···, 10, by 8, orally/in writing.

C-31 multiply 0, 1, 2, 3, ···, 10, by 9, orally/in writing.

C-32 multiply 0, 1, 2, 3, ···, 10, by 10, orally/in writing.

C-33 complete a multiplication test over each possible product of 2-9 and $1 \cdot N$, $0 \cdot N$ vertically or horizontally arranged, in 10 minutes with at least 95% accuracy.

C-34 list the first 6 multiples of 2, 3, 4, 5.

C-35 name the quotient of $N \div 1$, $N \leq 20$. Can use the "missing factor" concept to explain the quotient.

C-36 divide 2, 4, 6, . . . , 20, by 2, using missing factor concept. Checks result.

C-37 divide 3, 6, 9, . . . , 30, by 3, using missing factor concept. Checks result.

C-38 divide 4, 8, 12, . . . , 40, by 4, using missing factor concept. Checks result.

C-39 divide 5, 10, 15, . . . , 50, by 5, using missing factor concept. Checks result.

C-40 divide by 1-9 with 1 digit quotients and remainders. Uses $13 \div 6$ or computational form $6\overline{)13}$. Check results.

C-41 "skip-count" by 10's to 200, by 100's to 1000, by 1000's to 15,000.

C-42 name $100 \times n$, $n \leq 10$.

Multiplication-Division Strand

C-43 multiply any 1-digit number by 100, 200, 300, ..., 900.

C-44 multiply 2-digit numbers by 1 digit numbers, no regrouping

C-45 multiply 3 digit numbers by 1 digit numbers, no regrouping

C-46 multiply 2-digit numbers by 10, 20, 30, ..., 90, no regrouping

C-47 multiply 2-digit numbers by 100, 1000.

C-48 multiply 3-digit numbers by 10, 100, 1000.

C-49 supply the missing factor within 15 minutes with at least 95% accuracy for each possible product through 9 x 9, given one factor and the product.

C-50 identify the factors and product in a horizontal or vertical arrangement for multiplication.

C-51 rename (simplify) expressions such as 2 + (4 x 3), (2 + 4) x 3, and 4 x (9 - 5).

C-52 use parentheses to make expressions such as 2 + 4 x 3 = 14 and 2 x 3 + 4 = 14, true statements

C-53 name the missing number in number sentences involving more than one operation: e.g. (2 x 5) + 4 = □ and (3 + 2) x □ = 10

C-54 name the missing number in sentences such as □ x 13 = 13 x 12 and 8 x (□ x 9) = (8 x 7) x 9, to generalize the Commutative, Associative, Multiplicative Identity and Zero properties of multiplication

C-55 place ≠ or = to form true sentences such as 3 x (2 + 4) □ (3 x 2) + (3 x 4), to illustrate the Distributive Property

C-57 multiply any 2-digit by any 1-digit number (with regrouping). Can use expanded notation (and the Distributive Property) to explain the product

C-58 multiply 3-digit numbers, zero in 10's place, by 1-digit numbers

C-59 multiply 3-digit numbers by 1-digit numbers, regrouping in ones or tens place, but not both

C-60 multiply any 3-digit number by any 1-digit number

C-61 write number sentence for and can solve one-step worded/pictorial problems involving skills to this point

D-62 name at least one pair of factors (not using 1) for any composite number ≤ 50. (e.g.: Name solution sets for □ x △ = 42.)

D-63 divide 6, 12, 18 ..., 60 by 6. Checks result.

Multiplication-Division Strand

D-64 divide 7, 14, 21, . . ., 70, by 7. Checks.

D-65 divide 8, 16, 24, . . ., 80, by 8. Checks.

D-66 divide 9, 18, 27, . . ., 90, by 9. Checks.

D-67 demonstrate the relation of division to multiplication (e.g. $10 \div 2 = 5 \rightarrow 10 = 5 \cdot 2$).

D-68 complete a division test in ten minutes with at least 90% accuracy for each multiplication combination through 10 x 10, no remainders.

D-69 explain why $7 \div 3$ (etc.) has no whole number quotient.

D-70 divide any 2-digit number by 1 - 9. Checks.

D-71 divide 3-digit numbers, no zeros, by 1 - 9. Checks.

D-72 divide any 3-digit number by 1 - 9. Checks.

D-73 divide any 4-digit number by 1 - 9. Checks.

D-74 multiply any two 2-digit numbers, zero in units place of multiplicand.

D-75 multiply any two 2-digit numbers, no regrouping.

D-76 multiply any 3-digit number by 10, 20, 30, . . ., 90.

D-77 multiply any two 2-digit numbers.

D-78 multiply any 3-digit number, zero in tens place, by any 2-digit number.

D-79 multiply any 3-digit number by any 2-digit number.

D-80 multiply any two 3-digit numbers.

D-81 estimate the product of two 2-digit numbers to the nearest hundred.

D-82 complete sets of ordered pairs for numbers ≤ 50, given a rule for multiplication (e.g.: 3 N, then (1, 3), (2, 6), (5, 15), etc.).

D-83 determine the multiplication rule, given a set of ordered pairs derived from this rule, for numbers ≤ 50.

D-84 give positive evidence of knowledge that division by zero is undefined (meaningless). (e.g.: $12 \div 0 \neq N$ since $0 \cdot N \neq 12$.)

D-85 write the number sentence for and can solve one-step worded problems requiring division by 1-9, quotients to 10.

D-86 identify the factors and product in a number sentence such as $12 \div 3 = 4$.

D-87 identify the dividend, divisor, and the quotient in a number sentence such as $12 \div 3 = 4$ and $\begin{array}{r} 4 \\ 3\overline{)12} \end{array}$.

Multiplication-Division Strand

D-88 write the quotient of a division problem with a remainder, as a mixed number.

D-89 rename (simplify) expressions such as (3 + 8) x (28 ÷ 7).

D-90 use parentheses to make expressions such as 3 x 4 ÷ 2 + 1 = 4, true statements.

D-91 devise story problems to fit number sentences such as 36 ÷ 4 = □ and □ x 3 = 12.

D-92 devise a story problem to fit a number sentence involving more than one operation such as (3 + 4) x 2 = □.

D-93 write the number sentence for and can solve two-step worded problems involving skills to this point.

E-94 use the "order of operations" to write whole or mixed number names for 3- or 4-term expressions without grouping symbols, involving a combination of the operations and skills learned to this point.

E-95 divide any 2-digit number by any lesser 2-digit number.

E-96 divide 3-digit numbers by 20, 30, 40, . . ., 90, 1-digit quotients.

E-97 divide 3-digit numbers, no zeros in tens place, by 10, 20, 30, . . ., 90, 2-digit quotients.

E-98 divide 3-digit numbers by any 2- or 3-digit number, 1-digit quotients.

E-99 divide any 3-digit number by any 2-digit number.

E-100 estimate the quotient of two numbers, 3- or 4-digit by 1- or 2-digit, to the nearest 10, 100, or 1000, as requested.

E-101 write the number sentence for and can solve two-step worded problems involving skills to this point.

E-102 supply a missing number from a whole number sequence involving multiplication by a whole number constant. (Geometric progression)

E-103 supply a missing number from a whole number sequence involving division by a whole number constant. (Geometric progression)

E-104 name missing numbers(s) to make statements such as 8 x (□ + 9) = (8 x 7) + (8 x 9) and □ x (6 + 12)= (⬭ x 6)+ (△ x 12) true, to illustrate the idea of the Distributive Property of Multiplication over addition.

E-105 name the whole number factors of any composite number ≤64. (Complete factorization.)

E-106 rename a whole number ≤ 100 as a product of primes. (Prime factorization. e.g., 12 = 2 x 2 x 3.)

Multiplication-Division Strand

E-107 name the common factors of two different numbers ≤ 50.

E-108 name at least one common multiple of two different numbers ≤ 64.

E-109 name the least common multiple (L.C.M.) of two different numbers ≤ 64.

E-110 name the greatest common factor (G.C.F.) of two different numbers ≤ 100.

E-110a multiply any 4-digit number by any 3-digit number.

E-111 divide any 3- to 5-digit number by 100, 200, 300, . . ., 900.

E-112 divide any 3- to 5-digit number by any 2- to 4-digit number.

F-113 name the whole number factors of any composite number ≤ 100.

F-114 rename N x N as N^2, N x N as N^3, . . ., $N \leq 10$. (Exponential form of a number.)

F-115 rename N^2 as N x N, N^3 as N x N x N, N 10. Identifies base and exponent. Uses "square" and "cube" of a number.

F-116 write the prime factorization of any number ≤ 500 in exponential form (e.g., $36 = 3^2\ 2^2$).

F-117 compute the 'square' of any number ≤ 100.

F-118 determine the square root of perfect squares ≤ 144.

F-119 name the G.C.F. of three different numbers ≤ 100.

F-120 name the L.C.M. of three different numbers ≤ 100.

F-121 'round' numbers $\leq 1{,}000{,}000{,}000$ to the nearest power of ten requested.

F-122 determine the cube of any number ≤ 100.

F-123 determine the cube root of perfect cubes ≤ 400.

F-124 compute the products of 10 pairs of 1- to 5-digit numbers within 15 minutes with at least 90% accuracy.

F-125 compute the whole or mixed number quotients of 10 pairs of 1- to 6-digit numbers within 20 minutes with at least 90% accuracy.

F-126 write number sentences for and can solve two-step worded problems involving skills to this point.

F-127 name the missing number in sentences like 3 x 13 = (□ x 10) + (△ x 3), □ x △ = (5 x 7) + (5 x 8), and ⬡ x 16 = (□ x 10) + (△ x 6) to illustrate the idea of the Distributive Property of Multiplication over addition.

Rational Numbers Strand

VI. Rational Numbers Strand (Non-decimal)

The learner can:

A-1 separate ("divide") a suitable object (by paper folding, etc.) or even numbered sets of objects ≤ 10 in "halves" or in "fourths".

A-2 use "one-half" and "one'fourth" to name portions of an object.

B-2a use "one-half" and "one-fourth" to name portions of sets of ≤ 10 identical objects that are so partitioned.

B-3 separate a linear, a rectangular, or a circular region or a set of identical objects ≤ 20 in halves, fourths, or thirds.

B-4 use the terms "one-half", "one-fourth", and "one-third" to name portions of a region or a set of identical objects ≤ 20 that are separated into halves, fourths, or thirds.

B-5 point to or can circle one of the numerals, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, to indicate which part of a pictured region is shaded, or portion of a set of identical objects is "circled".

B-6 match the terms "one-half", "one-fourth", and "one-third" with $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, and with "one of (2, 3, 4) equal parts."

C-7 name orally/in writing the fraction in the set $\left\{\frac{1}{1}, \frac{2}{2}, \frac{2}{4}, \frac{2}{3}, \frac{3}{3}, \frac{3}{4}, \frac{4}{4}\right\}$ that indicates the portion of a linear, circular, or rectangular region that is shaded or the portion of a set of identical objects ≤ 36 that is "circled".

C-8 compare halves, fourths and thirds of appropriate physical models to establish the relative value of the fractions.

C-9 place $<$ or $>$ between any two of the numerals, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$, $\frac{2}{3}$, $\frac{3}{4}$, to make a true statement and can justify this by pictorial or set examples.

D-10 draw a picture to represent any fraction in the set $\left\{\frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \frac{2}{6}, \frac{3}{6}, \frac{4}{6}, \frac{5}{6}, \frac{2}{8}, \frac{3}{8}, \frac{4}{8}, \frac{5}{8}, \frac{6}{8}, \frac{7}{8}, \frac{8}{8}\right\}$.

D-11 partition identical objects (≤ 100) into 2-10 and 16 equivalent parts and can use the correct fraction name to indicate the relationship of one or more of these parts to the whole.

D-12 use objects or pictures to show $\frac{2}{4} = \frac{1}{2}$, $\frac{3}{6} = \frac{1}{2}$, and $\frac{4}{8} = \frac{2}{4} = \frac{1}{2}$.

D-13 identify the numerator and the denominator of a fraction.

D-14 identify like fractions and unlike fractions.

D-15 add any two or three proper fractions with like denominators.

D-16 subtract any two like fractions, positive difference.

D-17 list at least two equivalent fraction names for $\frac{1}{1}$, $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{8}$, and $\frac{1}{10}$.

Rational Numbers Strand (Non-decimal)

D-18 identify any given fraction as proper or improper.

D-19 identify the coordinate of a fraction ≤ 2 on a number line.

D-20 use the number line to determine the "order" of any two fractions: $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \frac{1}{6}, \frac{1}{8}, \frac{1}{10}, \frac{2}{3}, \frac{3}{4}$. Write number sentence using $<$ or $>$.

D-21 express improper fractions (numerators ≤ 20) as mixed numbers.

D-22 express mixed numbers (≤ 10) as improper fractions.

E-23 identify a point on a number line for any mixed number ≤ 10.

E-24 use the identity number for multiplication, or pictorial or physical representation, to illustrate at least four equivalent names for: $\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{3}{4}, \frac{2}{5}, \frac{3}{5}, \frac{4}{5}, \frac{5}{6}, \frac{3}{8}, \frac{5}{8}, \frac{7}{8}$.

E-25 name the numeral that completes a pair of equivalent fractions, given pairs with one of the numerators or denominators missing.

E-26 name the L.C.D. (least common denominator) of any two or three proper fractions, denominator ≤ 12.

E-27 place $<, =, >$ between any two fractions or their equivalents, in the set of E-24 to correctly express their relationship. Justifies by renaming with L.C.D. and with number line or pictured regions.

E-28 add any two fractions from the set $\left\{\frac{1}{2}, \frac{1}{3}, \frac{2}{3}, \frac{1}{4}, \frac{3}{4}\right\}$.

E-29 subtract, positive difference, any two fractions in the set in E-28.

E-30 add or subtract (positive difference) any two of the fractions of E-24.

E-31 add or subtract (positive difference) any two mixed numbers ≤ 50, denominators ≤ 16 (use only reasonable denominators), without "borrowing."

E-32 write the number sentence and solve two-step worded problems involving addition and/or subtraction of the fractions of E-24 and E-28.

F-33 use $<, =, >$ to state the relationship between any two proper fractions, denominators ≤ 64. (Use only reasonable denominators.)

F-34 identify fractions whose numerator and denominator are relatively prime.

F-35 give the simplest or basic name (simplify) of any fraction by factoring and using the Multiplicative Identity Property.

F-36 name the sum of any two unlike fractions in simplest terms.

F-37 name the positive difference of any two unlike fractions in simplest terms.

F-38 write the number sentence for and solve 1- or 2-step worded problems involving addition and/or subtraction of fractions and mixed numbers.

Rational Numbers Strand (Non-decimal)

F-39	multiply two fractions, numerators and denominators 1- or 2-digits. Can write product in simplest form.
F-40	multiply a whole number by a common fraction, denominator $\leq$ 64.
F-41	name the reciprocal of any whole number $\leq$100.
F-42	rename any improper fraction as a whole or mixed number.
F-43	rename any mixed number as an improper fraction.
F-43a	add or subtract (positive difference) any two mixed numbers or a common fraction and a mixed number.
F-44	multiply any whole number by any mixed number. Names simplest product.
F-45	multiply any mixed number by any mixed number. Names simplest product.
F-46	name a fraction between (in value) two given proper fractions. (Many answers.)
F-47	write the number sentence and solve two-step worded problems involving multiplication of fractions.
F-48	name the product in simplest terms of any whole number, common fraction, and mixed number.
F-49	name the reciprocal of any whole number, proper and improper fraction, and mixed number.
F-50	divide any whole number by any fraction, quotient in simplest terms.
F-51	divide any fraction by any fraction, quotient in simplest terms.
F-52	divide any mixed number by any fraction, quotient in simplest terms.
F-53	divide any fraction by any mixed number, quotient in simplest terms.
F-54	divide any mixed number by any whole number, quotient in simplest terms.
F-55	divide any whole number by any mixed number, quotient in simplest terms.
FG-56	recognize that there is no least positive rational number.
F-57	name the sum of any three unlike fractions in simplest form.
G-58	name the sum of any two to four addends containing whole numbers, mixed numbers, and common fractions, in simplest form.
G-59	name the positive difference of any whole number and any mixed number.
G-61	divide any positive rational number by any positive rational number with the quotient in simplest form.
G-62	order any two rational numbers from $^{-}100$ to $^{+}100$.

Rational Numbers Strand (Non-decimal)

G-63 name the multiplicative inverse of any rational number.

G-64 write the number sentence for and solve 2- and 3-step worded problems involving the four operations with common fractions and using grouping symbols.

H-65 solve simple one variable number sentences, involving grouping symbols and two operations.

H-66 write a flow chart for determining the equivalence of two fractions.

H-67 write a flow chart for the ordering of two fractions.

H-68 add or subtract any pair of rational numbers giving the answer in simplest form.

H-69 multiply or divide any pair of rational numbers giving the answer in simplest form.

H-70 solve two or three-step worded problems involving rational numbers using any combination of the four basic operations.

Geometry Strand

VII Geometry Strand

The learner can:

K-1 connect two given points with a "path", using a pencil, and names these points the "endpoints of the path".

K-2 identify open and closed curves.

K-3 identify the interior and the exterior of a closed curve. Excludes the curve from both regions. (Locate a point on, outside, or inside a curve.)

K-4 match at least two congruent objects in a set of objects by superimposing.

K-5 match at least two similar (by shape) objects in a set of objects or pictures of objects.

K-6 name two properties of a given object (color, size, mass, shape, density, function, etc.).

K-7 assemble the parts of a simple object, given a model of the completed object.

The learner can identify a picture or a physical model of:

K-8 a circle

K-9 a square

K-10 a triangle

K-11 a rectangle

K-12 an ellipse

K-13 a straight line

A-14 a curved line

A-15 parallel lines

The learner can identify a physical model of:

A-16 a sphere

A-17 a pyramid

A-18 a cube

A-19 "corners" and sides of triangles, squares, rectangles.

B-20 a cone

B-21 a cylinder

B-22 a prism

B-23 a face, an edge, and a vertex of a pyramid or a prism.

The learner can:

B-24 name the plane geometric figure represented by the lateral faces of a prism, a pyramid, and the bases of a cone or a cylinder

B-25 identify the lines (axes) of symmetry in the circle, square, rectangle, ellipse, and in (isosceles) trangles (by paper folding).

C-26 identify orally or in a matching exercise, congruent and non-congruent plane figures. Checks by superimposing.

C-27 identify orally or in a matching exercise similar plane figures: squares, circles, equilateral triangles. @ Knows that congruent figures are also similar figures.

Geometry Strand

The learner can identify, draw a picture of, and correctly name pictures and physical representations of:

C-28 point

C-29 line

C-30 ray

C-31 segment

C-32 parallel lines

C-33 angle

C-34 right angle

C-35 triangle

C-36 quadrilateral

C-37 parallelogram

C-38 rectangle

C-39 square

C-40 pentagon

C-41 hexagon

C-42 circle

C-43 ellipse

D-44 intersecting lines

D-45 perpendicular lines

D-46 oblique lines

D-47 horizontal lines

D-48 vertical lines

D-49 skew lines

D-50 cube

D-51 sphere

D-52 pyramid

D-53 prism

D-54 cylinder (circular)

D-55 cone (circular)

The learner can:

D-56 recognize that there is exactly one straight line through two distinct points.

D-57 recognize that many (unlimited number of) distinct lines may contain one point.

D-58 recognize a point as a position and a line or a portion of a line as a set of points, both of the latter being unlimited sets of points.

D-59 name the intersection set of two distinct straight lines as one point or no points (empty or null set).

D-60 identify the least distance between two points on a plane surface (or in 3-space) as a straight line path (segment).

D-61 use a "straight-edge" to determine if a surface is a plane (flat) surface.

D-62 identify plane, curved, and spherical (a special curved surface) surfaces by pointing to models.

D-63 name which of two models of angles has the greatest or least measure.

D-64 correctly label points of a circle "South", "East", and "West", having one point of the circle labeled "North".

D-65 identify isosceles, equilateral, and scalene triangles.

D-66 identify and name the number of sides, angles, and vertices of a quadrilateral, a pentagon, and a hexagon.

Geometry Strand

D-67 identify, name and sketch a circular region, a triangular region, and a square region. Distinguishes between the region and its boundry (circle, triangle, square).

D-68 identify similar triangles (without measurement).

E-69 correctly label points of a circle "NW", "SW", "SE", "NE", "E", "S", "W", if some point of the circle is labeled "N", to represent a compass.

E-70 use a pair of compasses ("compass" is not correct) to draw a circle of given radius.

E-71 determine the approximate diameter or radius of a circle by measuring.

E-72 define circle, radius, and diameter.

E-73 identify a hemisphere, its center, its radius, and its diameter.

E-74 define parallel lines.

E-75 measure the distance between two parallel lines.

E-76 identify the interior of an angle whose measure is $\leq 180^\circ$.

E-76a name the degree measure of a right angle.

E-77 draw pictures of and identify acute angles and obtuse angles.

E-78 identify and draw a picture of the diagonals of simple polygons.

E-79 determine the relationship of the diagonals of a rectangle (congruent and bisect each other) by measuring with compasses or by paper folding.

E-80 distinguish whether a plane geometric figure has point or line symmetry.

E-81 use compasses to bisect an angle. Checks it by paper folding.

E-81a define obtuse and acute angles.

E-82 use compasses to construct conguent segments.

E-83 use compasses to construct congruent angles.

E-84 use compasses to construct a perpendicular bisector of a segment. Checks it by measurement or paper folding, and protractor.

E-85 use compasses to construct a line perpendicular to a given line at a given point of that line. Checks it with protractor.

E-86 use compasses to construct a line perpendicular to a given line from a point not on the given line. Checks it with protractor.

F-87 describe a plane as a smooth, 2-space, flat surface (no thickness); a set of points with no space (dense) between neighbor points.

F-88 interpret 3-space as the set of all points. Interpret 2-space and 1-space.

F-89 identify vertices of cones and polyhedrons (pyramid, cube, prism, etc.).

F-90 identify face regions and edges of cubes, pyramids, and prisms.

Geometry Strand

F-91 identify the diagonals of common polyhedra.

F-92 identify the type of face regions of common polyhedra.

F-93 identify various prisms (triangular, quadrangular, pentagonal, etc.). Includes cubes in the set of prisms.

F-94 identify lateral surfaces, faces, and bases of cylinders, cones, pyramids and prisms.

F-95 determine that a sphere and a cube each have point symmetry, intuitively.

F-96 determine similar rectangles by measurement.

F-97 describe the line(s) of symmetry of a sphere and of a cube.

F-98 describe the plane(s) of symmetry of a sphere and of a cube.

F-99 identify, label, and draw pictures of a rhombus and of a trapezoid.

F-100 identify regular and non-regular polygons.

G-101 distinguish between the circumference of a circle and the circle.

G-102 identify and draw pictures of adjacent angles.

G-103 identify and draw pictures of vertical angles.

G-104 use a protractor to identify and to draw pictures of complementary angles.

G-105 use a protractor to identify and to draw pictures of supplementary angles.

G-106 identify and define horizontal, vertical, and skew lines.

G-107 determine if a triangle is possible, given the lengths of the sides.

G-108 draw a model of the regular polygons of 3 to 10 sides, given the name of the polygon, and conversely.

G-109 agree that a line containing any two distinct points in a plane lies entirely in the plane.

G-110 name the intersection set of two distinct planes (line or empty set).

G-111 name the intersection set of a distinct line and a plane (point, line, or empty set).

G-112 identify or form a model of two distinct parallel planes.

G-113 name three possible ways for three distinct planes to intersect (line, three parallel lines, three concurrent lines).

The learner can give an operational definition of:

G-114 triangle G-115 square G-116 rectangle G-117 parallelogram

Geometry Strand

The learner can:

G-118 use tree or Venn diagrams to classify the subsets of the set of quadrilaterals.

G-119 match each of the following names with its appropriate word description or model: scalene Δ, obtuse Δ, acute Δ, right ⊿, isosceles Δ, equilateral or equiangular Δ, parallelogram, rectangle, square, rhombus, trapezoid, scalene quadrilateral, pentagon, hexagon, octagon, decagon.

G-120 define congruent triangles, and identify congruent triangles by measuring.

G-121 define congruent polygons.

G-122 define similar triangles, and identify similar triangles by measuring.

G-123 identify corresponding parts of congruent and similar triangles.

H-124 match each of the following names with its appropriate word description or model: right rectangular prism, oblique prism, cylinder, pyramid, cone, sphere, cube.

H-125 sketch a reasonable picture of a cube and of a non-cubical right rectangular prism.

H-126 correctly label each quadrant of a plane rectangular coordinate system with the numerals I, II, III, IV.

H-127 graph a set of fice (or more) ordered pairs of integers in the four quadrants, on the axes, or at the origin of a rectangular coordinate system.

H-128 state the ordered pair name of five (or more) points located in the four quadrants, on the axes, or at the origin of a rectangular coordinate system.

H-129 score 80% or better on a standarized perspecive test of drawings of 3-D geometric figures.

H-130 use compasses and straight edge to construct triangles congruent to a given set of three non-congruent triangles.

H-131 use compasses to inscribe an equilateral triangle, a square, and a regular hexagon in a given circle.

H-132 use a protractor to inscribe a regular pentagon in a given circle.

H-133 classify pyramids by their bases.

H-134 describe or define a great circle of a sphere.

H-135 graph equations of the form $X = K$ or $Y = K$ on the coordinate system.

H-136 graph equations of the form $X = Y = K$ on the coordinate system.

H-137 graph equations of the form $d = rt$ on the coordinate system.

Decimals Fractions Strand

VIII Decimal Fractions

E-1 rename fraction numbers and mixed numbers whose denominators are 10 or 100, as decimal fractions.

E-2 write the word name and orally state the decimal value indicated by each digit of a decimal fraction, to thousandths.

E-3 rename given decimal fraction numerals to thousandths, 0-1000, using expanded notation.

E-4 orally read and can write word names for given decimal fraction numerals to thousandths, from zero through one-hundred.

E-5 write the numeral for any given decimal word name, zero through ten-thousandths.

E-6 order any given sequence of two or three decimal fraction numbers to thousandths, ≤ 100. (This includes whole numbers.).

E-7 'round off' decimal fraction numbers through thousandths, to units, tenths, or hundredths.

E-8 rename the fractions ≤ 2 whose denominators are 10, 100, or 1000, as decimal fractions.

E-9 rename the decimal fractions ≤ 1000, to thousandths, as fractions/mixed numbers.

E-10 add two to five positive decimal fraction numbers, to thousandths, and whole numbers, whose sum is $\leq$ 1,000,000.

E-11 subtract a whole number from a decimal number, to thousandths, positive difference $\leq$ 10,000.

E-12 subtract two positive fractional numbers $\leq$ 10,000, to thousandths, with positive difference

E-13 subtract a decimal number, to thousandths, from a whole number, positive difference $\leq$ 10,000.

E-14 write a number sentence for and can solve two- and three-step worded problems involving addition and/or subtraction of positive decimal fraction numbers $\leq$ 1,000,000, to thousandths.

E-15 multiply a positive decimal fraction number by 10, 100, or 1000.

E-16 multiply a positive decimal fraction number by 0.1, 0.01, or 0.001.

E-17 multiply a whole number and a positive decimal number, to thousandths, each $\leq$ 1,000,000.

E-18 multiply two positive decimal fraction numbers, to thousandths, each $\leq$ 1,000,000, using the common algorithm.

E-19 write a number sentence for and can solve two- or three-step worded problems involving addition, and/or subtraction, and/or multiplication of decimal fraction numbers, to thousandths and $\leq$ 1,000,000.

Decimal Fractions

F-20 order any sequence of two or three decimals, through millionths.

F-21 write decimal equivalents of proper fractions with denominators that are powers of 2 (2, 4, 8, 16, 32).

F-22 can write the word name and orally state the decimal value indicated by each digit of a positive decimal fraction numeral to millionths.

F-23 can orally read and write the word name for a given decimal fraction numeral $\leq$ 1,000,000, to millionths.

F-24 write the numeral for and can orally read a given word name of a decimal fraction to millionths, from 0 to 1,000,000.

F-25 'round off' decimal fraction numbers through millionths, to the nearest tenth, hundreth, ···, as requested.

F-26 divide decimals $\leq$ 10,000, to thousandths, by whole numbers to 1,000,000.

F-27 divide whole numbers to 1,000,000 by decimals to tenths, $\leq$ 100.

F-28 divide whole numbers to 1,000,000 by decimals to thousandths, $\leq$ 100.

F-29 divide decimals by decimals, through thousandths, $\leq$ 1,000,000.

F-30 write a number sentence for and can solve two- and three-step worded problems involving the four basic operations with positive decimal numbers $\leq$ 1,000,000, to thousandths.

G-31 rename a common fraction as a decimal fraction to nearest thousandths.

G-32 determine whether a common fraction respresents a terminating decimal fraction or a repeating decimal fraction.

G-33 determine the equivalent common fraction name for often-used terminating or repeating decimal fractions.

G-34 add a decimal fraction and a common fraction.

G-35 subtract a decimal fraction and a common fraction.

G-36 multiply a decimal fraction and a common fraction.

G-37 divide a decimal fraction and a common fraction, either of the pair being the divisor.

G-38 rename 100, 200, 300, ···, 1-million as $N \times 10^a$, $N \{1, 2, 3, \cdots, 9\}$ (e.g., $300 = 3 \times 10^2$).

G-39 give the simplest equivalent name for 10^6, 10^5, 10^4, ···, 10^{-6} and the base 10 exponential names for 1000, 100, 10, ···, 0.000001.

G-40 use exponential notation to rename whole numbers and decimal fractions in expanded form.

G-41 multiply a decimal fraction by powers-of-ten by 'moving the decimal point.'

Decimal Fractions

G-42 divide a decimal fraction by powers-of-ten by 'moving the decimal point!

G-43 write a number sentence for and can solve two-or three-step worded problems involving combinations of skills to this point.

GH-44 rename any decimal fraction using scientific notation (e.g. $1987 = 1.987 \times 10^3$, $0.0501 = 5.01 \times 10^{-2}$, etc.).

GH-45 rename any number written in scientific notation in its decimal form.

H-46 multiply two decimal fractions when written in scientific notation.

H-47 divide two decimal fractions when written in scientific notation.

H-48 write a flow chart for placing the decimal point in the product of two decimal numbers.

H-49 write a flow chart for renaming a decimal fraction in scientific notation.

H-50 write a flow chart for renaming scientific notation as a decimal number.

Proportion, Percent Strand

IX Proportion, Percent Strand

The learner can:

C-1 interpret simple ratio situations, such as 2 apples for 15 cents, and can write this as "2 apples per 15 cents," and "2 apples/15 cents."

D-2 recognize that ratios such as "2 pencils/5 cents" and "4 pencils/10 cents" are equivalent (represent the same ratio).

D-3 write sets of equivalent ratios for given physical situations.

E-4 determine if two ratios are equivalent by applying the Multiplicative Identity Property (e.g., $\frac{3}{4} \cdot \left(\frac{3}{3}\right) = \frac{9}{12}$. "Cross-products" is not favored.).

F-5 name a ratio for two like measurements (e.g., 200 kgm to 600 kgm, 36 cm to 5 m, etc.).

F-8 solve for the missing element in each of four given proportions.

F-9 use proportions to solve simple worded problems.

G-10 use ratios to compare quantities and express rates.

G-11 use proportions to solve moderately difficult worded problems, involving skills to this point.

G-12 interpret "percent" as a ratio in which the second term is always 100 ("per hundred"). (e.g., 12% means 12 per 100, or $\frac{12}{100}$.).

G-13 use a fraction, a decimal fraction, and a percent to describe the shaded portion of a 10-by-10 grid.

G-14 rename ratios and decimal fractions from 0 to 1 as percents, using %.

GH-15 automatically name the percent equivalents of $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{8}$, $\frac{1}{10}$.

GH-16 automatically name the fractional equivalents of 50%, $33\frac{1}{3}$%, 25%, 20%, $16\frac{2}{3}$%, $12\frac{1}{2}$%, 10%.

GH-17 rename percents from 0 to fractional 100% as decimal fractions.

GH-18 rename percents from 0 to 100% as ratios.

GH-19 rename positive decimal fractions, 0.001 to 10, as percents, using %.

GH-20 rename positive rational numbers 0-10, whose denominators are 3 or less digits, as percents (%).

GH-21 rename percent from 0 to 1000% as decimal fractions.

GH-22 use proportions or equations to solve: "X% of Y is ______?"

GH-23 use proportions or equations to solve: "______% of Y is Z?"

GH-24 use proportions or equations to solve: "X% of ______ is Z?"

GH-25 solve two- or three-step worded problems involving percents from 0.1% to 1000%.

Probability Strand

X Probability Strand

The learner can:

F-1 name the number of pairings possible when each element of a first set is paired with each element of a second set (Cartesian Product).

F-2 distinguish between certain and uncertain events.

G-3 recognize when the outcomes for a given experiment are equally likely (e.g., heads and tails of a "fair" coin).

G-4 list and/or count all the possible outcomes for an experiment for which the simple events are single elements (tossing a die, etc.).

G-5 assign probabilities to the outcomes of an experiment for which the simple events are equally likely (e.g., the probability of "3" occuring in tossing a die).

G-6 recognize that the probability of an event is a number p such that $0 \leq p \leq 1$, and recognize that the probability of a certain event is 1 and the probability of an impossible event is 0.

G-7 recognize that the probability of an event does not guarantee how often the event will occur (e.g., "3" will not happen necessarily once in six tosses of a die.).

H-8 assign probabilities to the outcomes of experiments for which the simple events are not equally likely (e.g., spinner arrow stopping on red in an unequally colored circular region).

H-9 estimate the probability of an outcome of an experiment by empirical methods (e.g., estimate the probability that a bottle cap will land cork side up after recording N trials.).

H-10 list and/or count all the possible outcomes for an experiment for which the simple events are ordered pairs, simple combinations, or simple permutations (e.g., two coins, two dice, etc.).

H-11 recognize how the probability of a specific outcome will change from trial to trial when sampling is done without replacement.

H-12 estimate the probability of an event from previous data (e.g. batting record, won-loss record, etc.).

H-13 estimate information about a population by random sampling.

1979 Mathematics (K-8) Performance Objectives

Test Items

Measurement Strand

K-1 Materials: Number Rods (one of each length from 1 through 10).

Procedure: Place the rods in front of the child.

Teacher may ask questions such as
Show me a rod littler than the yellow rod.
Show me a rod bigger than the yellow rod, etc.
Show me the littlest rod.
Show me the biggest rod.

K-2 Materials: Number Rods (Cuisenaire rods, etc.)

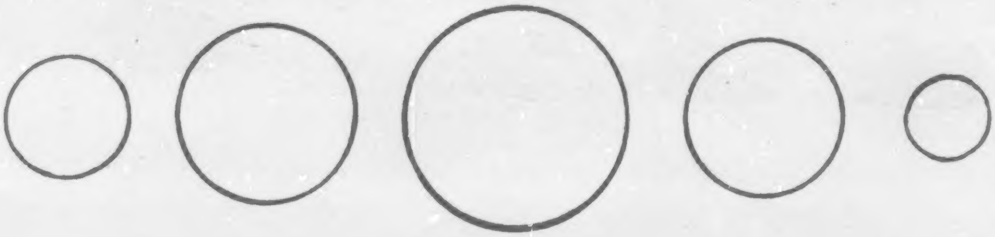
Procedure: Show me a rod shorter than the blue rod.
Show me a rod longer than the brown rod.
Show me the shortest rod.
Show me the longest rod.

K-3 Procedure: Place a small group of children in a line.

Who is taller than Jim?
Who is shorter than Sue?
Who is the tallest?
Who is the shortest?

K-4 Materials: Worksheet or overhead projector.

Procedure: Point to the largest circle.
Point to the smallest circle.
Point to a circle smaller than this one (indicate a circle).
Point to a circle larger than this one (indicate a circle).



K-5 Materials: Number rods, blocks

Procedure: Place the like rods in separate piles. Are all the rods in each pile the same?
Select one of each color into one group.
Are these rods the same?
Are they different?

(Use piles of 3 or 4 blocks.) Do these piles have the same number of blocks or a different number of blocks?

K-6 Same as K-5 - Use terms "like" and "not alike."

K-7 Materials: Counters

Procedure: Place a set of 5 counters
4 counters
3 counters
2 counters in front of the child.
Ask questions about which has more than or fewer than another set.

K-8 Procedure: Direct the child to give you some of the counters.
Place them back in the group.
Ask the student to give you all of the counters.
Repeat for none.

K-9 Materials: Pencil, book (objects with greatly varying weights that the child can lift.)

Procedure: Have the child compare two at a time and tell which is heavier (lighter).
Have him identify the heaviest (lightest) of the set.

K-10 Materials: See K-7

Procedure: Ask questions about which set has the most/least.

K-11 Materials: Pairs of sets of counters of unequal numbers < 10.

Procedure 1: For each pair, ask the child to tell you:
"Set A has less than Set B," and
"Set B has more than Set A."

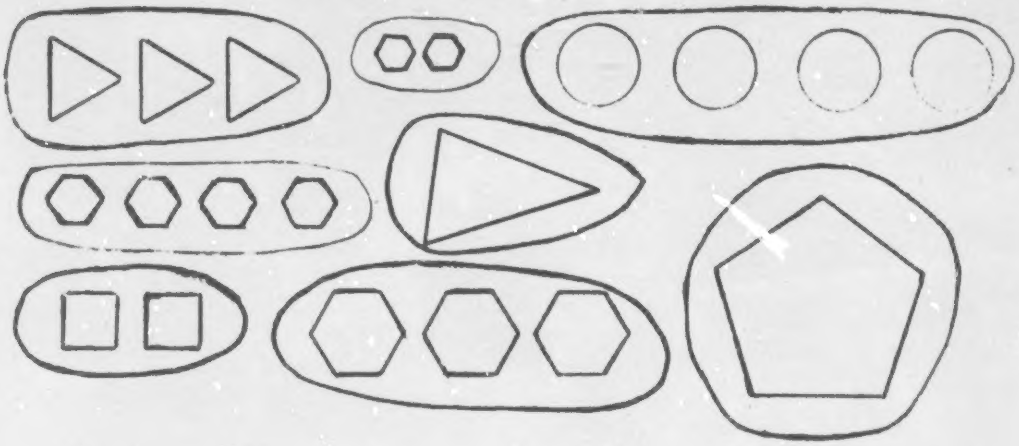
Procedure 2: Form a set of less than 6 elements.

Ask the child to build a set of more (less) elements than your set.

K-12 Materials: Counters

Procedure: (The word equivalent should be used but need not be mastered.)

Ask the student:
1. to form a set equivalent to yours;
2. to form two equivalent sets; and
3. to match the equivalent sets on a pictured configuration similar to the one pictured below.



K-13 Materials: Large box or cord and object ("it")

Procedure: Instruct the student to place "it" -
inside the box (circle, closed curve, etc., formed with the cord)
outside the box

K-14 Procedure: Point to (touch) the top of the box (etc.)
Point to the bottom of the box.

K-15 Procedure: Hold "it" above the box (table top, etc.)
Place "it" below the box

K-16 Procedure: Place "it" under the box
Place "it" over the box

K-17 Procedure: Instruct the student to hold "it" in his(her) hand

"lift it up"	"point up"
"let it down"	"point down"

K-18 Procedure: "Tell me about something very far away." "Tell me about something near."

K-19 Procedure: Place three or more students in a line.

"If John is the first in line, who is last?"
"If Henry is the last in line, who is first?"

K-20 Procedure: "Who is to the right of (left of) Joe. (Check to see that more than one person or object can be to the right of Joe in child's mind.)

K-21 Materials: Set of solids of various sizes placed on various levels of height and proximities to each other.

Procedure: Show me the highest (lowest) object; higher, lower; high, low.

K-22 Procedure: Point to the one behind (in front of) the ___________

K-23 Procedure: Point to the one beside (by) (next to) the __________.

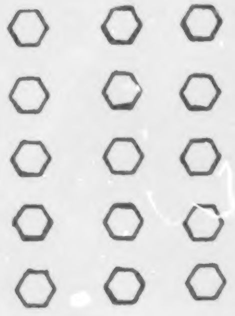
K-24 Procedure: Point to the one close to (away from) the ___________

K-25 Materials: Sheet with geometric figures in rectangular array as shown.

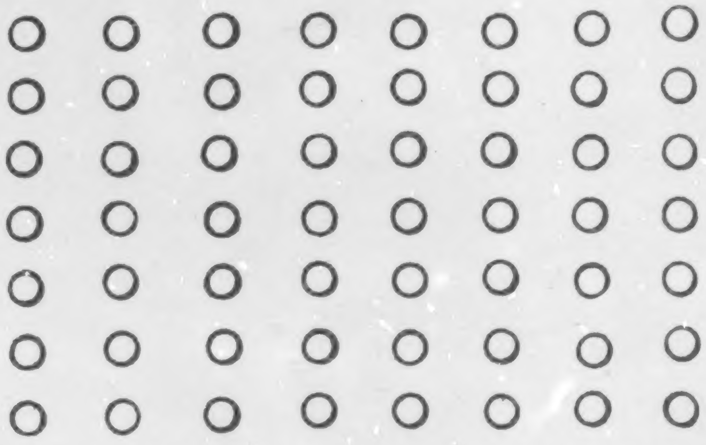
Procedure: Instruct the child to "ring" or draw a line through

1. each row;
2. each column.

Ring Each Row



Ring Each Column



K-26, 27, 28

Procedure: Place three students in a row. Ask the child being tested to:

1. walk around the three,
2. name the child between the other two, and
3. name the person in the middle.

K-29 Materials: Ball, toy car, etc.

Procedure: Start the object moving from some point, then stop it. Ask, "Where did the ball start?" "Where did it end?"

K-30 "Do we have mathematics before or after recess (lunch, etc.)?"
"Jo can sharpen her/his pencil before (after) Dale."

K-31 "Who came to school early today? Was anyone late to school today?"
"Does the sun rise early or late in the day?"
"Who in your home gets up the earliest? Who goes to bed the latest?"

K-32 "Are you young? Are you old?"
"Who has a younger (older) sister/brother?"
"Who is the oldest in your family (this class/room)?"
"Who is the youngest in your family (this class)?"

K-33 Materials: Glasses of cool and cold water and glasses of warm and hot water.

"Which of these glasses of water is cold/colder/coldest (hot/hotter/hottest)."

K-34 "Which of these two glasses of water is cool/the cooler/the coolest?" (Repeat for warm, the warmer, the warmest.)

K-35 What is money? How do we use money?

K-36 Materials: 12 pennies
3 nickels
1 dime

Procedure: Ask the student to sort the money into pennies, nickels and dimes and "name each pile."
Show the child a nickel. "Bring me (show me) the number of pennies that will buy the same as the nickel."
Repeat for pennies and a dime, nickels and a dime.

K-37 Materials: A clock.

Procedure: What is a clock?
What does a clock do?
How do people use a clock?
How do we use the clock?

K-38 Procedure: When does the sun come up?
When do you eat breakfast?
When do you eat lunch? (dinner - for rural)
When do you eat dinner? (supper)
When does the sun go down?
When do you go to bed?

K-39 Materials: Calendar

Procedure: Show the child the calendar.

What is this?
How do we use it?
What does it tell us?

K-40 Materials: Thermometer

Procedure: Ask the child:

What is this? How do we use it? What does it tell us?

K-41 Materials: Set of Cuisenaire Rods

Procedure: Give the child the set of rods and ask:

How many white rods does it take to make a yellow rod?
How many red rods does it take to make a black rod?
How many yellow rods does it take to make an orange rod?
How many light green rods does it take to make a blue rod?
How many purple rods does it take to make a black rod?

K-42 Materials: Model of a clock with movable hands

Procedure: Place the hands of the clock in three or four appropriate "hour" positions and have child name the indicated time.

A-43 Materials: A set of pennies, nickels, dimes, quarters, half-dollars and a dollar bill (at least one each)

Procedure: Ask the student to sort the coins and bills and "name each."

A-44 Materials: Three sets of pennies, nickels and dimes.

A = (4 pennies, 1 nickel, 1 dime)

B = (2 dimes, 3 pennies)

C = (3 nickels, 7 pennies)

Procedure; Ask the child to name the value of each set.

A-45 Materials: Paper, pencil, pennies, nickels, dimes, or good facsimilies of the coins. Could use transparencies of the latter on the overhead.

Procedure: Read the following to the student(s) and observe the response(s).

1. I have three pennies. How many cents is this?

2. Heather pays two nickels for a candy bar. How many pennies/cents is this?

3. David has two dimes in his pocket. This is equal to how many pennies/cents?

4. Bryan paid 12 cents for a pencil. What coins could he/she use?

A-46 Materials: Counters and containers

Procedure: Place counters in the containers, 5 in one, 6 in the next through 12 and 13.
Instruct the student to (show) bring you the container(s) with a dozen counters.
Instruct the student to bring you the container with a half-dozen counters.

A-47 Materials: Clock with one movable hand

Procedure: Place hand midway between any two adjacent hour marks.

"The hand is between what two numbers?"
Select one of these numbers and ask, "Is the time after or before _____ o'clock?"

A-48 Materials: Clock with movable hands

Procedure: Place the clock hands in three or four appropriate half-hour positions and ask student to state the time indicated.

A-49 Materials: Calendar

Procedure: Ask the student to read the names of the months and days of the week on the calendar.

A-50 Materials: Calendar

Procedure: Give the student a calendar and ask him to point out and read to you the (today's) month, day and date.

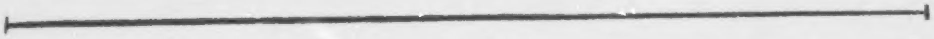
A-51 Materials: A set of 10 objects of different sizes and weights. The largest object should not necessarily have the greatest weight.

Procedure: Ask the child to arrange the objects according to their size (length or weight, etc.) smallest to largest (lightest to heaviest).

A-52 Materials: Cuisenaire Rods (or any rod)

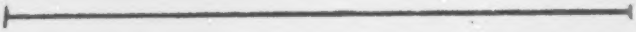
Procedure: Given the set of line segments and the yellow rod, ask the child to measure each with the yellow rod.

1.



(The child should report, "It is more than two sticks and less than 3 sticks." "It is closest to three sticks.")

2.



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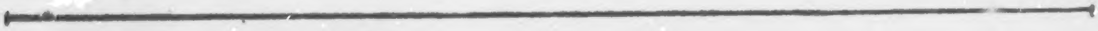

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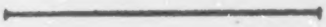


B-53 Materials: Calculator tape and Cuisenaire Rods

Procedure: Direct the student to select a unit and make a ruler (mark off units) on the tape.

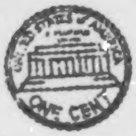
Ask him to measure an appropriate length (desk, room, etc.) with his ruler.

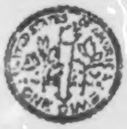
B-54 Materials: Meter stick

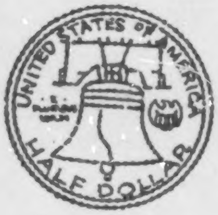
Procedure: Ask the student to measure the length and width of the room to the nearest meter.

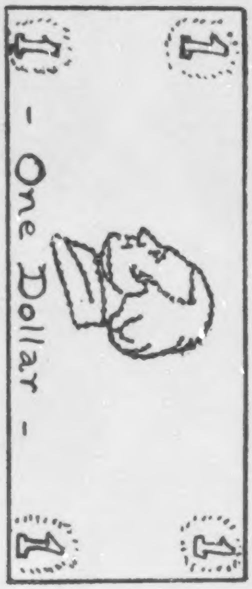
B-55 Draw lines from the picture to the word that describes it.

1.






UNITED STATES OF AMERICA
HALF DOLLAR


1
1
- One Dollar -
1
1

Penny

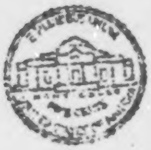
Nickel

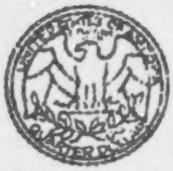
Dime

Quarter

Half-dollar

Dollar




QUARTER DOLLAR

2. One nickel is worth _______ pennies.

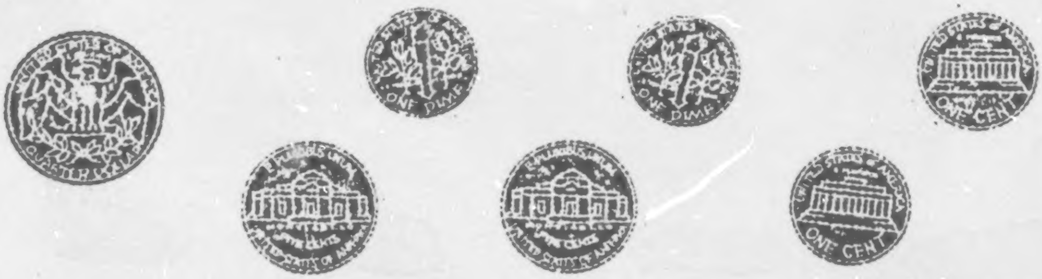
One dime is worth _______ nickels.

One quarter is worth _______ nickels.

One half-dollar is worth _______ quarters.

One dollar is worth _______ half-dollars.

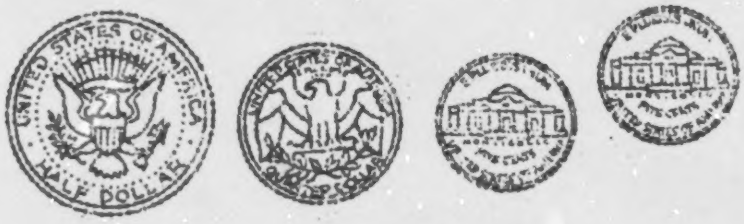
B-56 The coins pictured below are worth _______ pennies.



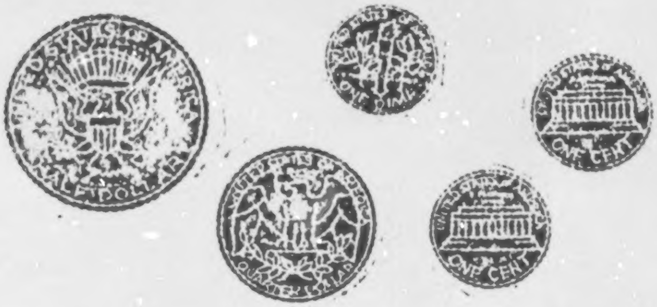
(It is better to use more than one set of actual coins for this item.)

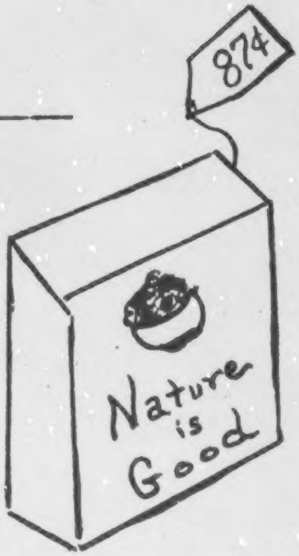
B-57 Which of the sets of coins pictured below can purchase the 87¢ box of breakfast food?

A.

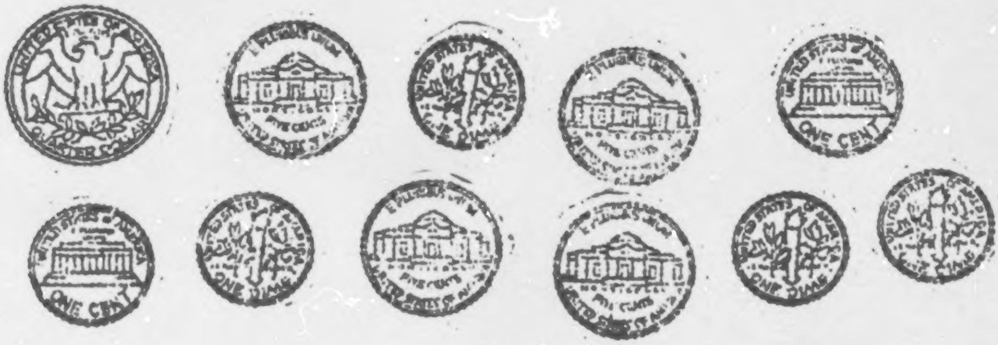


B.





C.

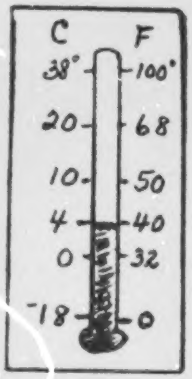


Answer: ______ and ______

(Again, use actual coins if possible. Place the coins in containers. Ask the student to match the equal valued sets of coins.)

B-58 Materials: Model of a thermometer with a movable "mercury" level. Both Fahrenheit and Celsius scales.

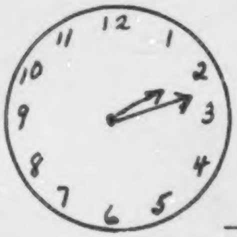
Procedure: Move the "mercury level" to two or three positions and ask student to read the "temperature" to the nearest degree Celsius and Fahrenheit -- or use the questions below.



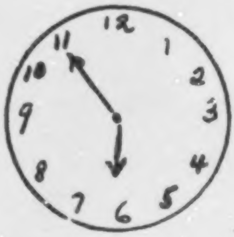
1. What is the temperature on the Fahrenheit scale on the thermometer pictured? ________

2. What is the temperature on the Celsius scale on the thermometer pictured? ________

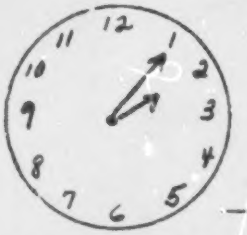
B-59 Direct the student to read and write the times on the clock face(s) to the nearest 15 minutes.



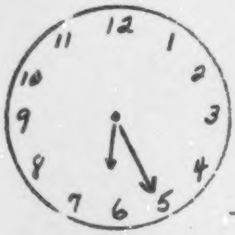
______ o'clock



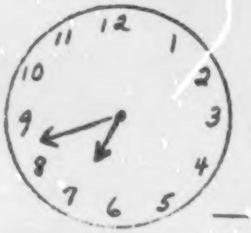
______ o'clock



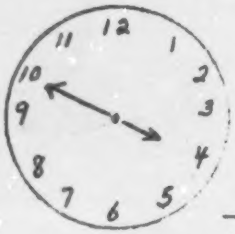
______ o'clock



______ o'clock



______ o'clock



______ o'clock

B-60 Ask the child to name (orally and in writing) the calendar year.

B-61 Procedure: Ask the students to name (orally and in writing) the days of the week in order.

B-62 Procedure: Direct the student to name (orally and in writing) the months of the year in order.

B-63 Teacher names day and month. Child goes to calendar, turns to correct month and points to stated date.

Also, teacher points to date on calendar and child states correct date, day and month.

B-64 Procedure: Ask the child to write his response as you ask (orally):

1. Which is longer, an hour or a day?
   Which is longer, a week or a month?
   Which is longer, a month or an hour?

2. How many days in a week?
   How many hours in a day?
   How many seasons in a year?
   How many weeks in a month?

B-65 Materials: Marking pens
Three transparent containers - one of greater volume than the others; the others of different shape, and height and nearly the same volume.

Procedure: Give the student the two smaller containers filled (almost) with water, one containing slightly more than the other. Direct the student to use the empty container and the marker to determine which container has the greater volume.

B-66 Materials: Several pint and quart containers.

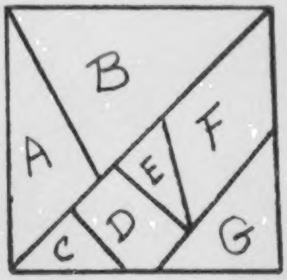
Procedure: Direct the student to find how many pints of water the quart will hold. Child can identify the names also.

B-67 Same as B-66, using liters and quarts.

B-68 Materials: Equal arm Balance beam
Sets of objects in pairs

Procedure: Direct the student to use the beam to compare the weights and mark (identify) the heavier object of each pair.

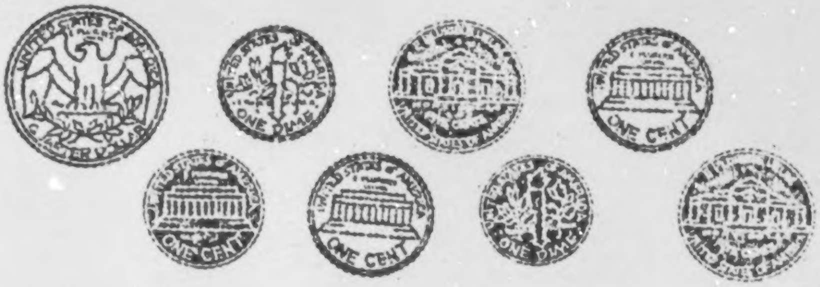
B-69 **Materials:** Tangram with the sections labeled A, B, C, D, E, F, G (or three pieces of paper of unequal area.)



Procedure: Ask which is larger? Let student work on his/her own before suggesting a method. Then suggest that he/she order the pieces from smallest to largest.

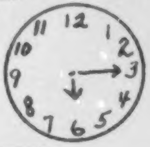
B-70 **Procedure:** Teacher reads the following to the students. The student should have a copy to read at the same time.

1. Diana has

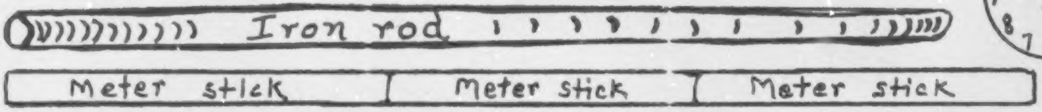


How much is this worth? ____________________ cents?

2. What time does the clock show? __________________



3.



Steve decided that the iron rod is about 3 meters long.

Kirk decided that it is about 2 meters long.

What would you say is the length of the rod? ________ Meters

4. What month is shown on the calendar? ________
What year? ________________
What date is circled ________
What day is this? __________
Is this month in the spring, summer, fall, or winter in Iowa? ________________

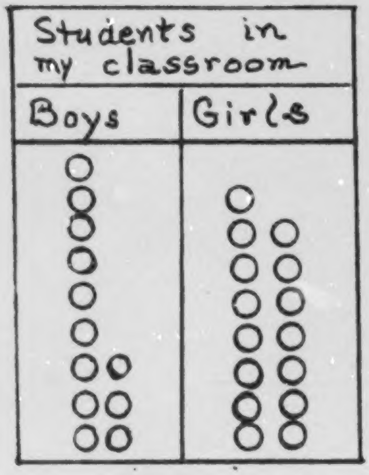
MAY					1980	
S	M	T	W	Th	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	$\boxed{15}$	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

5. Place less than, equal to, or greater than in the space to make the following statements true.

a. One pint is __________________ one quart.
b. One liter is __________________ one pint.
c. The weight of your pencil is ______________ the weight of your shoe.
d. The area of this sheet _________________ the area of your desk top.

B-71 Make a graph on your paper showing the number of boys and girls in your classroom (or group). Draw a ☐ for each student.

B-72



The graph shows ____________ boys in the classroom.

There are ____________ girls in the classroom.

How many students are in the classroom?

____

C-73 Direct the student to complete the sentences.

1. There are _______ inches in a foot.
2. There are _______ feet in a yard.
3. There are _______ inches in a yard.

C-74 Direct the student to complete the sentences.

1. There are _______ decimeters in a meter.
2. There are _______ centimeters in a meter.
3. There are _______ centimeters in a decimeter.

C-75 Materials: Meter stick and yard stick (separate)

Procedure: Direct the student to measure the dimensions of the room, mark distances in the hall or other convenient distances to the nearest meter (yard).

C-76 Materials: Rule marked in decimeters and a foot rule.

Procedure: Instruct the students to measure the width, length and height of their desk to the nearest decimeter (foot).

C-77 Materials: Rule marked in centimeters and rule marked in inches. (Meter stick and yard stick will serve.)

Procedure: Instruct the student to measure the length, width, and height of his desk to the nearest centimeter (inch).

C-78 Materials: Rule marked in cm and a rule marked in inches.

Procedure: Instruct the student to construct line segments of:

1. 10 centimeters
2. 15 centimeters
3. 3 centimeters
4. 10 inches
5. 8 inches
6. 3 inches

C-79 Materials: Meter stick marked to at least .5 cm. precision and yard stick marked to at least .5 inch precision.

Procedure: Place strips of tape on the floor of the room or hall at the distances specified below and ask the student to measure the distance between the strips to the nearest .5 cm. or .5 inches.

Place strips at distances:

$$\left.\begin{array}{ll} 1. & 9.373 \text{ meters} \\ 2. & 6.034 \text{ meters} \\ 3. & 3.592 \text{ meters} \end{array}\right\} \begin{array}{c} \text{measure to the nearest .5 cm,} \\ \text{and} \\ \text{measure to the nearest .5 inch.} \end{array}$$

C-80 Materials: Yardstick(s) in view of students or on their desks.

1. Name the number of inches in $\frac{1}{2}$ foot. ________

2. Name the number of inches in $\frac{1}{2}$ of three feet. ________

3. Name the number of inches in $\frac{1}{3}$ of a foot. ________

4. Name the number of inches in $\frac{1}{4}$ of two feet. ________

C-81 **Materials:** Meter stick(s) in view of students or on their desks.

1. Name the number of centimeters in $\frac{1}{2}$ meter. ________
2. Name the number of centimeters in $\frac{1}{4}$ meter. ________
3. Name the number of centimeters in $\frac{1}{5}$ meter. ________
4. Name the number of centimeters in $\frac{1}{10}$ meter. ________

C-82 **Materials:** New pencil, desk top, their own shoe, their friend's shoe, etc.

Procedure: Direct the student to estimate the length (width) of an object and then measure it to check his estimate.

C-83 **Materials:** Shoe box or similar sized box (rectangular prism)

Procedure: Ask the student to determine

1. How many centimeter (inch) blocks it would take to cover the top (side) of the box.
2. How many centimeter (inch) blocks it would take to fill the box.
3. How many centimeter (inch) blocks it would take to lay along one edge.

Then ask student to tell which of the three values (area, volume, length) he/she was measuring in each case.

C-84 **Materials:** Play money

Procedure: Place a set of bills and coins in each of five envelopes marked A, B, C, D, E (less than $10 in each.) Ask the student to write the value of the money in each envelope on the record sheet.

A ____________

B ____________

C ____________

D ____________

E ____________

C-85 Procedure: Teacher helps students read the problem, or better still uses actual money while posing the problem.

1. You purchase 85¢ worth of peanuts with a $1 bill.

   What and how many coins should you receive as change?

Penny	Nickel	Dime	Quarter

2. You have 75¢ left to spend and purchase 37¢ worth of candy.

   What and how many coins should you receive as change?

Penny	Nickel	Dime	Quarter

C-86 Procedure: Teacher helps students read the problem, or better still uses actual money while posing the problem.

1. You give the attendant $3.50 for a purchase of $3.11.

   What and how many coins and bills should you receive in change?

Penny	Nickel	Dime	Quarter	Dollar

2. You purchase $2.58 worth of groceries, using a $5 bill.

   What and how many coins and bills should you receive in change?

Penny	Nickel	Dime	Quarter	Dollar

C-87 1. Write 10 cents as a number of dollars. $_____

2. Write 75 cents as a number of dollars. $_____

3. Write two dollars and 45 cents as a number of dollars. $_____

C-88 Materials: Paper clock for each student or one that all can see.

Procedure: Instruct the students to set their clocks at 9:30 a.m. and ask (orally or in written form) -

How many hours and minutes is it until:

Answers

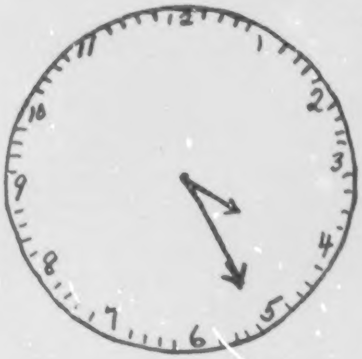
1. Lunchtime (_____ o'clock)? _____ Hours _______ Minutes

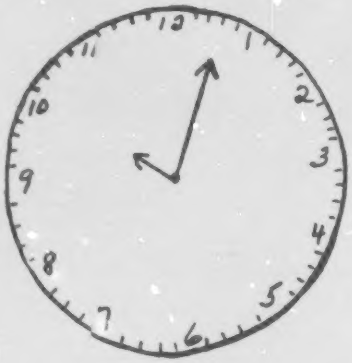
2. Recess (_____ o'clock)? _____ Hours _______ Minutes

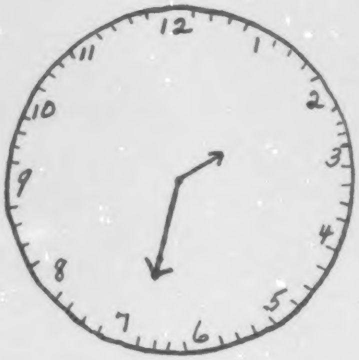
3. School gets out (_____ o'clock)? _____ Hours _______ Minutes

4. School starts tomorrow morning (_____ o'clock)? _____ Hours _______ Minutes

C-89 Read (orally) the clocks below to the nearest minute. Write this time in the space below the clock.







_______o'clock _______o'clock _______ o'clock

C-90 Complete the sentences below.

1. It is now 2:45 p.m.

   This is ______ hours ______ minutes after 12:00 noon.

2. It is now 10:00 a.m. In 3 hours, 23 minutes it will be

   _______ (time).

3. My desk is 2 feet 3 inches wide, and 4 feet 6 inches long.

   The desk is ______ feet ______ inches longer than it is wide.

4. If the desk were 1 foot 3 inches wider it would be _____ feet

   ______ inches wide.

5. At the right is a cash register tape from the store.

   $ .17
   .13
   1.06

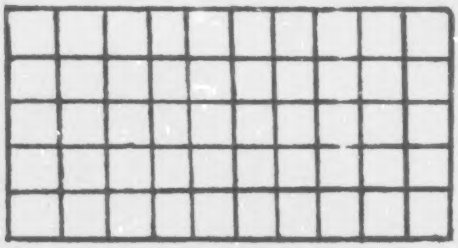
   The total spent was $________ .

   The change from $2 should be $________.

C-91 Materials: Centimeter cubes or sq. cm. overlay for #3.

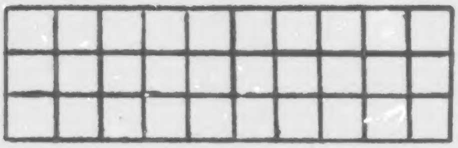
Procedure: Ask the student to write the area of the rectangles shown in the spaces below.

1.



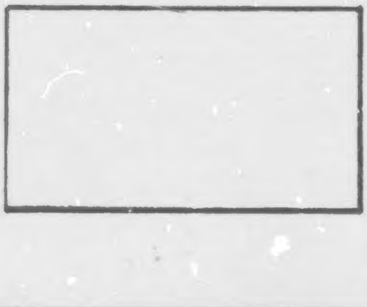
area = ______ square units.

2.



area = ______ square units.

3.



area = ______ square units.

C-92 Materials; Inch (or cubic centimeter) counting blocks and boxes (containers of) less volume than the number of counting blocks available.

Procedure: Give the student the blocks and containers and ask the volume of each container.

C-93 Materials: Cup, pint, quart and gallon containers. Two unscaled containers of water A and B and one empty unscaled container.

Procedure: Direct the student to write the volume of each container to the nearest cup, pint, quart and gallon.

A Contains	B Contains
_____ Cups	_____ Cups
_____ Pints	_____ Pints
_____ Quarts	_____ Quarts
_____ Gallons	_____ Gallons

C-94 Materials: One decileter container
Two containers of water, A and B, and one empty container.

Procedure: Direct the student to find the number of decileters in each container and convert to liters.

A	B
_____ Decileters	_____ Decileters
_____ Liters	_____ Liters

C-95 Materials: Equal arm balance, ounce weights, gram weights and two small objects to be weighed.

Procedure: Direct the student to weigh each object to the nearest ounce and to the nearest gram.

Object A	Object B
_____ Grams	_____ Grams
_____ Ounces	_____ Ounces

C-96 1. Name the number of ounces in a pound. ________

2. Name the number of ounces in one-half a pound. ________

3. Name the number of ounces in one-fourth a pound. ________

4. Name the number of grams in a kilogram. ________

5. Name the number of grams in one-half a kilogram. ________

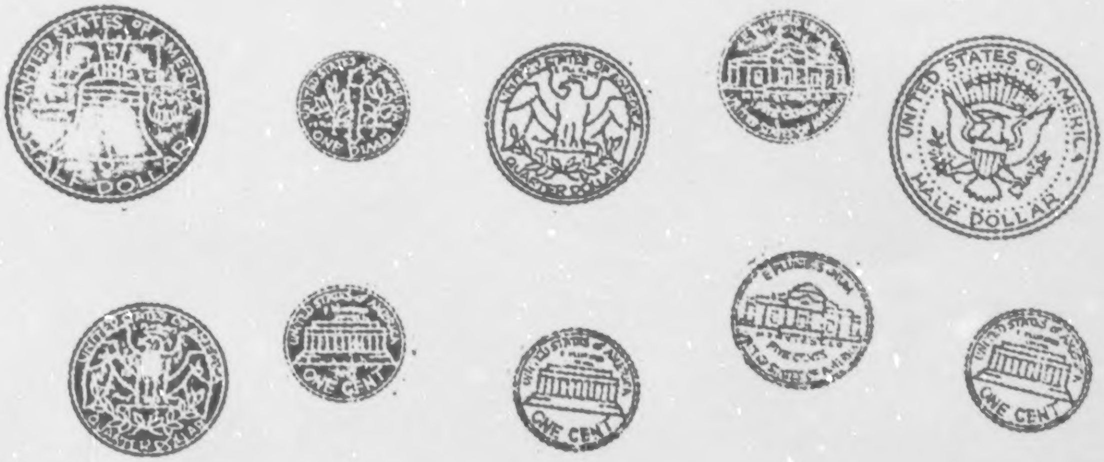
6. Name the number of grams in one-fourth a kilogram. ________

C-97 Materials: Two scales, one metric, one English.

Procedure: Direct the child to weigh himself/herself to the nearest pound/kilogram and record the weights.

C-98 Procedure: Teacher reads the following to the students. The student has a copy to read.

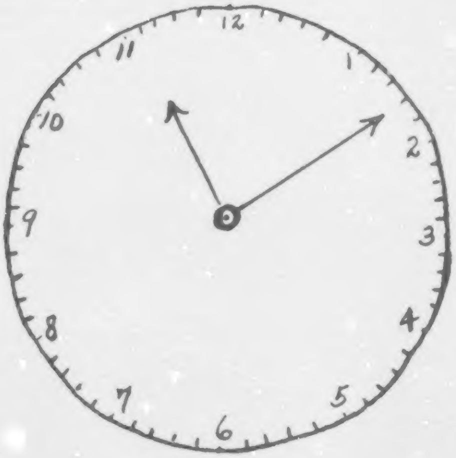
1. Suppose you have the following coins in your pocket or purse.


UNITED STATES OF AMERICA
HALF DOLLAR
ONE DIME
QUARTER DOLLAR
UNITED STATES OF AMERICA
HALF DOLLAR
QUARTER DOLLAR
ONE CENT
ONE CENT
FIVE CENTS
ONE CENT

Name the correct amount of money. $________

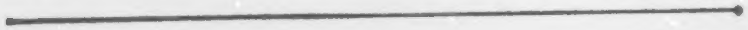
C-98 Continued

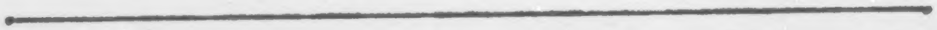
2. What time does the clock show, to the nearest minute?

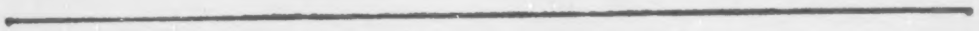


_______________ o'clock

3. Use a ruler to decide which of the following marks (line segments) is nearest 13½ cm (centimeters) in length.

A. 

B. 

C. 

4. Without measuring, estimate (guess) the width of this paper in inches.

About _________ inches

C-99 Write the number sentence for and solve each of the following.

1. Carey has $1.52 and Kay has 89¢. The total of this money is how much?

2. Ferne has a board one yard long. She cut one foot off this board. How long is the remaining board?

3. Gretchen cut 20 centimeters off a meter stick. How many centimeters long is the remaining portion?

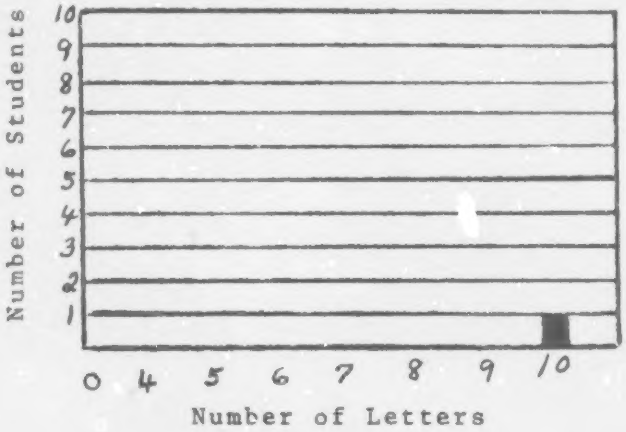
4. If someone started this test at 10:15 a.m. and took 20 minutes to complete the test, at what time will they finish?

_________ a.m.

C-100 Make a bar graph on your paper that shows the number of letters in the names of the students listed below.

Smith
Jones
Rice
Kilgore
Moon
Finney
Denny
Cummings
Arnold

Manning
Michael
Schoonover
Scott
Lewis
Lyons
Fellers
Jackson
Crawford
Adam



C-101 Use the graph to answer the following questions.

1. At what time was the lowest temperature?

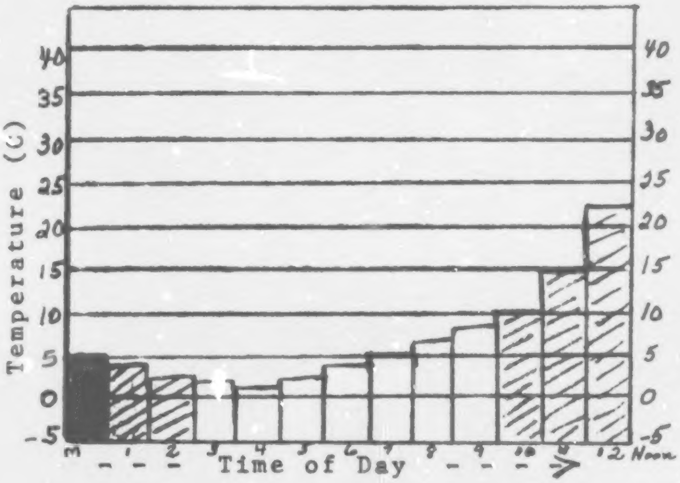
____

2. At what time was the highest temperature?

____

3. What is the temperature at 10:00?

____

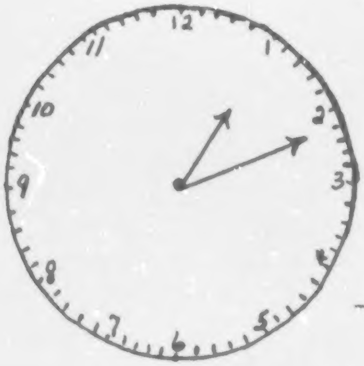


4. At what time is the temperature about 7° C? __________

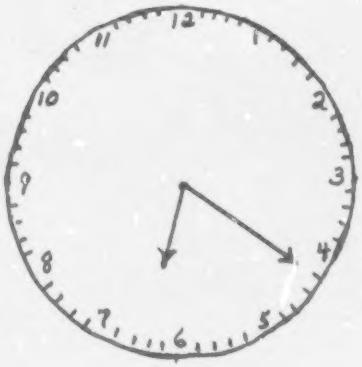
C-102 Use the above graph to tell about what temperature will occur at 1:00 p.m.

____

D-103 Write the time indicated, to the nearest minute (12:08 p.m., etc.) beside the clocks pictured below.


12
1
2
3
4
5
6
7
8
9
10
11

____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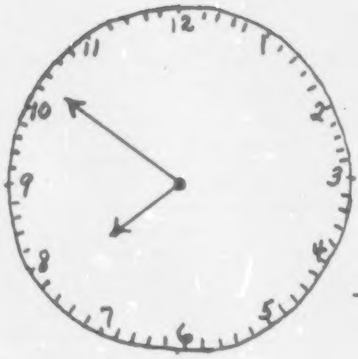
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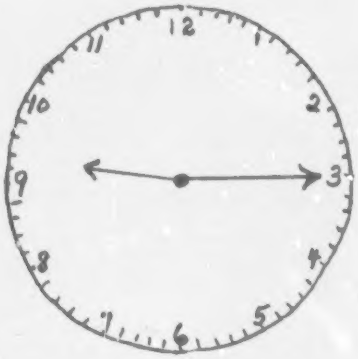
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D-104 Use decade, century, millenium to complete the following statements:

1. One hundred years is a __________.

2. Ten years is a __________.

3. One thousand years is a __________.

4. 1980 will be the beginning of the ninth __________ of the twentieth __________.

5. We are now in the second __________ after the birth of Christ.

D-105 Complete the sentences:

There are ______ days in a leap year.

There are ______ days in a non-leap year.

D-106 Complete the sentences:

There are _______ days in January.

There are _______ days in February (Leap Year ____ days).

There are _______ days in March.

There are _______ days in April.

There are _______ days in May.

There are _______ days in June.

There are _______ days in July.

There are _______ days in August.

There are _______ days in September.

There are _______ days in October.

There are _______ days in November.

There are _______ days in December.

D-107 Materials: Play money

Procedure: Place $\leq$ \$20 in each of 3 envelopes A, B and C. Direct the student to write the amount of money in each envelope.

A \$_______ B \$_______ C \$_______

D-108 1. For a purchase of \$8.13, you give the clerk \$9.00. What change should you receive?

\$ ________

2. You are the clerk. A customer purchases items totaling \$7.47 and hands you a ten dollar bill. List below the best combination of change to give the customer. Use the fewest number of coins and bills possible.

Penny	Nickel	Dime	Quarter	Dollar

D-109 Add or subtract as indicated.

1. \$5.85 +\$3.47

2. \$12.15 -\$ 4.66

3. \$19.00 -\$ 2.89

D-110 Complete the following statements.

1. There are ________ inches in a foot.

2. There are ________ inches in a yard.

3. There are ________ feet in a yard.

4. There are ________ feet in a mile.

D-111 Complete the following statements.

1. There are ________ millimeters in a centimeter.

2. There are ________ centimeters in a meter.

3. There are ________ meters in a kilometer.

D-111a Select the best statement.

1. The width of this piece of paper is about
   - a. 8 1/2 inches
   - b. 8 1/2 feet
   - c. 8 1/2 yards
2. The distance from the floor to a door knob (handle/latch) is about
   - a. 1 inch
   - b. 1 foot
   - c. 1 yard
3. The length of this sheet of paper is about
   - a. 28 millimeters
   - b. 28 centimeters
   - c. 28 meters
4. The height of a door is about
   - a. 2 millimeters
   - b. 2 centimeters
   - c. 2 meters

D-112 1. Circle the unit of length you would use to measure the length of the classroom?

Yards Feet Inches

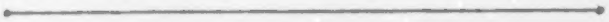
2. Circle the unit of length you would use to measure the width of your pencil.

Meter Centimeter Millimeter

3. Circle the unit of length you would use to measure the length of the school yard.

Kilometer Meter Centimeter

D-112A Name the measure of the following segment to the nearest $\frac{1}{4}$ inch.



Answer: ____________

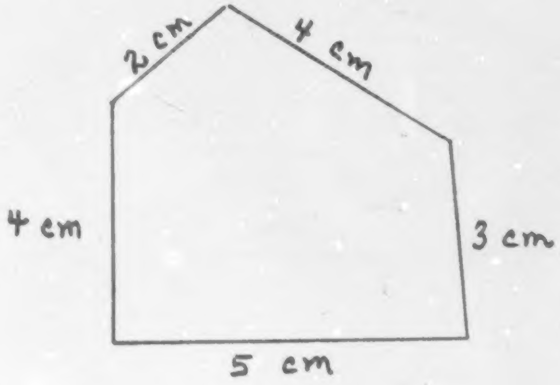
D-113 Materials: Rulers. Metric/English

1. What is the perimeter of this sheet of paper?

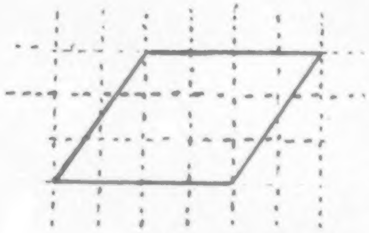
____________ inches/cm

2. What is the perimeter of the figure pictured?

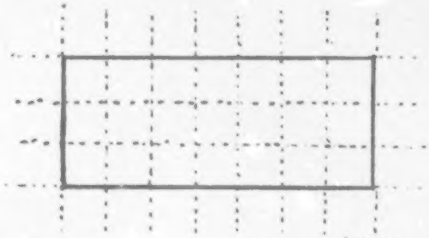
____



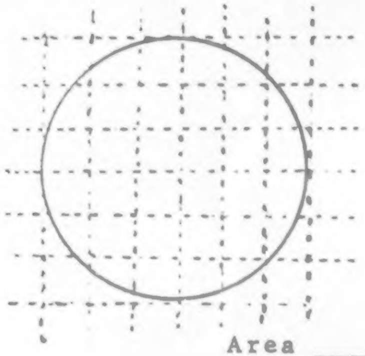
D-114 Name the area of each of the figures below.



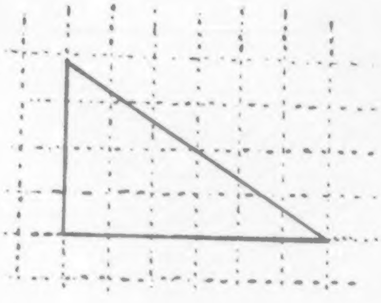
Area ________



Area ________



Area ________



Area ________

D-115 Complete the following sentences.

1. There are ________ milliliters in a liter.

2. There are ________ milliliters in a deciliter.

D-116 Materials: Containers, one graduated in ounces, the other in milliliters (cc), and two quantities of water in other containers.

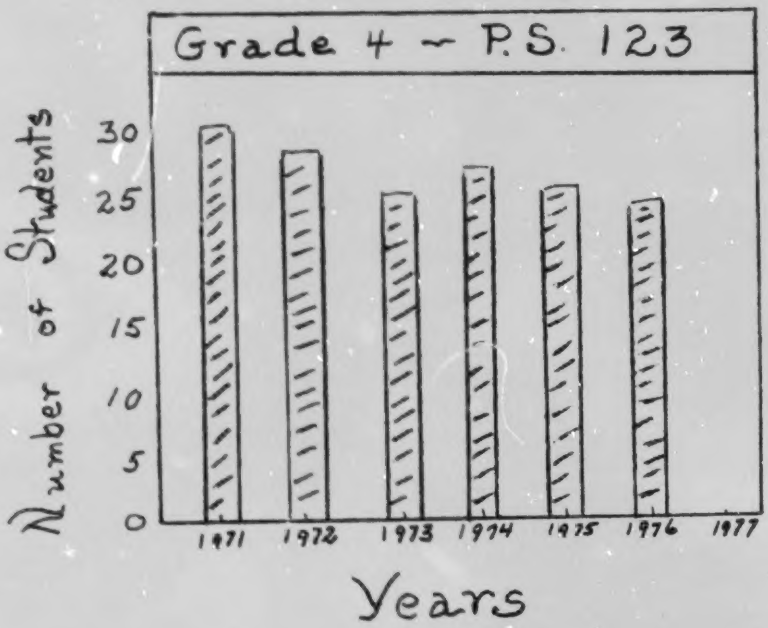
Procedure: Direct the student(s) to measure each quantity of water in ounces and in milliliters, and to record weights.

D-117 Materials: A balance scale, sets of English and Metric weights and two reasonably small masses. (Textbooks work well.)

Procedure: Direct the student(s) to measure the weight of each mass to the nearest $\frac{1}{2}$ pound and to the nearest gram.

D-118 Write number sentences for and solve the following:

1. From the information on the graph, how many students less were there in Grade 4 in 1975 than in 1971?



2. School starts at 8:15 a.m. at the junior high schools and at 8:50 a.m. at the elementary schools. School gets out at 3:00 p.m. at both. How much longer do junior high students attend school each day?

3. If you purchased the following items and gave the clerk a $20 bill, what change should you receive?

Tire pump	cost	$12.97
Light bulb	cost	.85
Tire gauge	cost	2.63

$ __________ Change

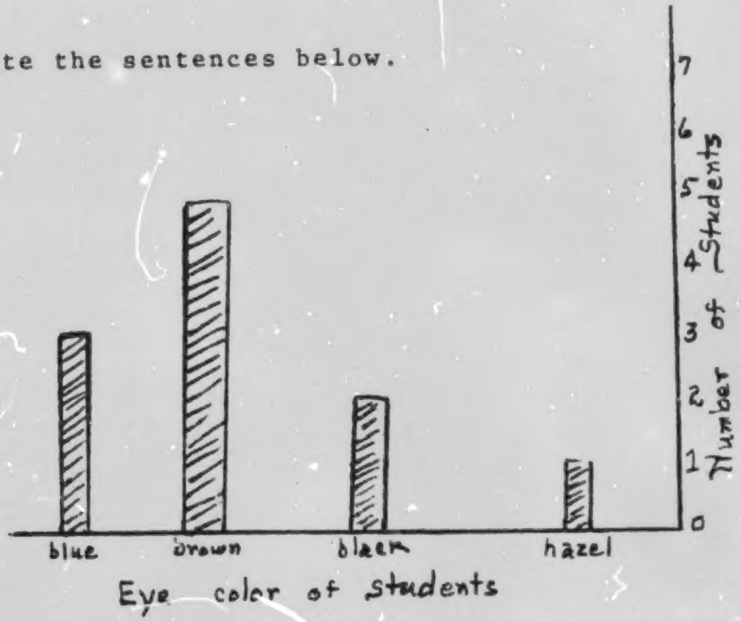
List the least number of coins and bills you would receive as change.

Penny	Nickel	Dime	Quarter	One-dollar

D-119 Complete the following table, then draw a bar graph to picture the data in the table.

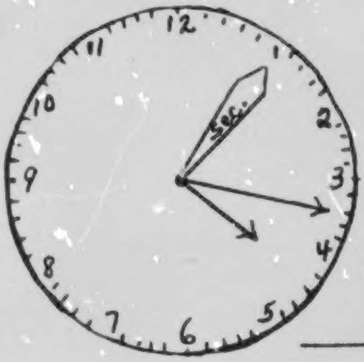
Number of students in your class wearing red clothing.	
Number of students in your class wearing green clothing.	
Number of students in your class wearing blue clothing.	
Number of students in your class wearing clothing without red, green, or blue in it.	

D-120 Use the graph to complete the sentences below.

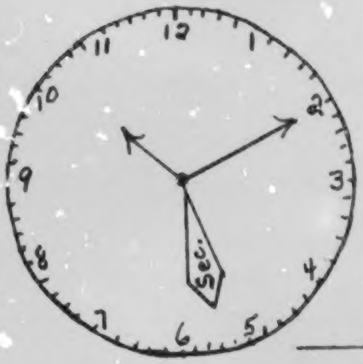


1. According to the graph there are _______ blue eyed students in the group.
2. According to the graph there are _______ brown eyed students in the group.
3. According to the graph there are _______ black eyed students in the group.
4. According to the graph there are _______ hazel eyed students in the group.
5. There are _______ students represented on the graph.

E-121 Read each clock below to the nearest second and record this.
(For example - 12:15:02 p.m.)



________o'clock



________o'clock

E-122 1. How many minutes are in two hours? ________ Minutes

2. How many minutes are in three hours? ________ Minutes

E-123 1. How many seconds are in two minutes? ________ Seconds

2. How many seconds are in $5\frac{1}{2}$ minutes? ________ Seconds

E-124 1. The basketball game started at 7:15 p.m. and ended at 9:35 p.m. How long did the game last? ________hours ________minutes

2. From 9:08:10 a.m. to 12:15:15 a.m. is ________hours ________ minutes ________ seconds.

E-125 1. If the program starts at 2:10 p.m. and last 2 hours and 55 minutes, what times does it end?

2. Toni starts at 9:17 a.m. from Tech and walks North for 1 hour and 32 minutes, then stopped to rest. What time did Toni stop?

E-126 1. What year is this? 19______.
2. What was the last leap-year? ________.
3. What is the next leap-year? ________.
4. Leap-year is necsary

a) for Valentine's Day to exist.

b) to correct the time error accumulated during the previous three years.

c) to provide a special day for weddings to be held.

E-127 1. 120 minutes is _______ hours.

2. 4 hours is _______ minutes.

3. 36 hours is _______ days.

4. 14 days is _______ weeks.

5. 4 weeks is _______ days.

6. 12 weeks is approximately _______ months.

E-128 1. From June 5 to July 1, not including either date, is _____ days.

2. From and including September 1, through and including December 25, is _______ days.

E-129 1. 120 inches is _______ feet.

2. 24 feet is _______ yards.

3. 2 yards is _______ inches.

4. 1 mile is _______ feet.

E-130 1. 100 millimeters is _______ centimeters.

2. 1 centimeter is _______ millimeters.

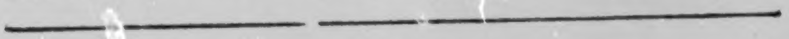
3. 2 decimeters is _______ centimeters.

4. 3 meters is _______ centimeters.

5. 2 kilometers is _______ meters.

E-131 1. The length of the mark (line segment) below is nearest

a) 112 mm b) 11 cm c) 22 mm



2. The length of the segment above is nearest

a) $4\frac{2}{8}$ inches b) $4\frac{4}{8}$ inches c) $4\frac{3}{8}$ inches

E-132 1. Give your estimate of the length of your school building in feet. _____________ feet.

2. Give your estimate of the width of the roadway in front of your school building in meters. _______________meters.

E-133 List the least number of coins and bills you could receive as change from $20 for a purchase of $12.32

Penny	Nickel	Dime	Quarter	One-dollar

E-134 Area is

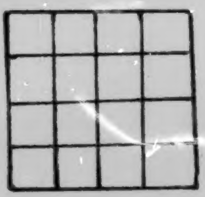
a) the perimeter of a figure.

b) the number of square units that would cover the figure.

c) the same as the volume of a figure.

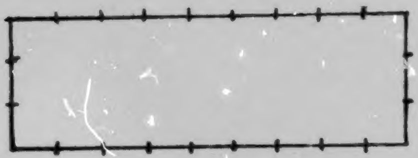
E-135 Name the area of each rectangle.

1.



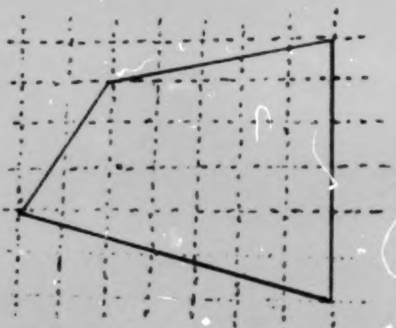
Area = ______________ square

2.



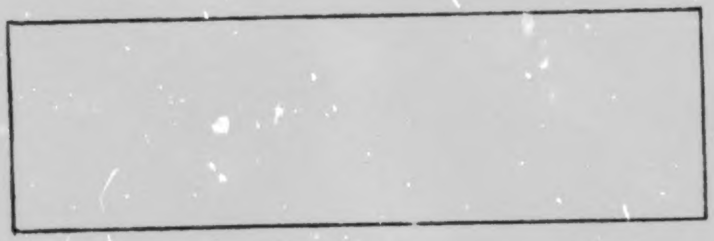
Area = _______ square units

E-136 Name the area of the figure below.



Area = __________ square units

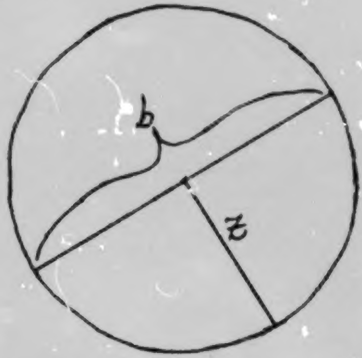
E-137 Without measuring, estimate the area of the following figure in square centimeters.



Area is about

__________ square cm

E-138 Use the circle at the right to state which of the following statements are true.



1. b is a radius. T - F

2. z is a radius. T - F

3. b is a diameter. T - F

4. z is a diameter. T - F

5. The radius of a circle is always half its diameter. T - F

6. The diameter of a circle is always half its radius. T - F

E-139 1. The number of quarts in a gallon is

a) 2 b) 4 c) 6 d) 8

2. The number of pints in a gallon is

a) 2 b) 4 c) 6 d) 8

E-140 Complete each of the following. Write the answer in the simplest form.

1. $8.56
+ 3.78

2. 12 feet 3 inches
+ 9 feet 10 inches

3. 3 hrs. 5 min. 10 sec.
+1 hr. 55 min. 20 sec.

4. $20.12
- 7.98

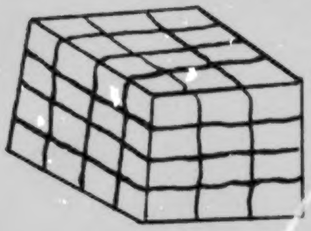
5. 8 feet 5 inches
-4 feet 9 inches

6. 5 hrs. 15 min.
-1 hr. 30 min. 10 sec.

E-141 Name the volume of the "box" pictured. The box is filled with cubes.

Volume = ____________

Cubic Units



E-142 Volume is

1. the number of square units that would cover the figure.
2. the number of cubic units that would fill the space bounded by the figure.
3. the perimeter of the figure.

E-143 Materials: Small rectangular prism (box), cubic centimeter/cubic inch models.

Procedure: Ask the student to estimate the volume of the box in cubic centimeters/cubic inches. Show the model of the unit of measure you request.

E-144 Materials: Equal-arm balance, Metric/English mass units, two small items to weigh.

Procedure: Ask the student to weigh the two small items, using the balance and the mass units.

E-145 Place <, =, or > in each box to form a true statement.

1. One mile ☐ one kilometer.
2. One yard ☐ one meter.
3. One quart ☐ one liter.
4. One pound ☐ one kilogram.

E-146 Use the data from the table to construct a line graph, then answer the question about the graph.

1.

Date and Time		Temperature
June 1	12:00 a.m.	70° F
	12:00 p.m.	58°
June 2	12:00 a.m.	75°
	12:00 p.m.	65°
June 3	12:00 a.m.	81°
	12:00 p.m.	68°
June 4	12:00 a.m.	72°
	12:00 p.m.	55°
June 5	12:00 a.m.	83°
	12:00 p.m.	69°

2. (Multiple Choice)

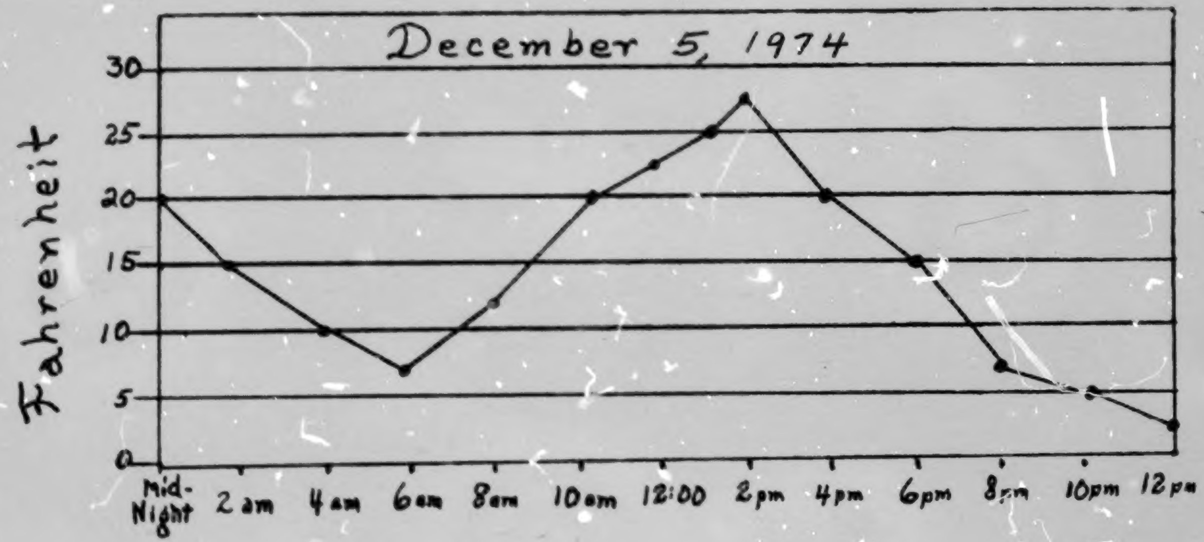
The graph shows

a) daily maximum and minimum teperatures.

b) temperature variation from noon to midnight.

c) outside temperatures for one month.

E-147 Examine the graph to answer the questions.



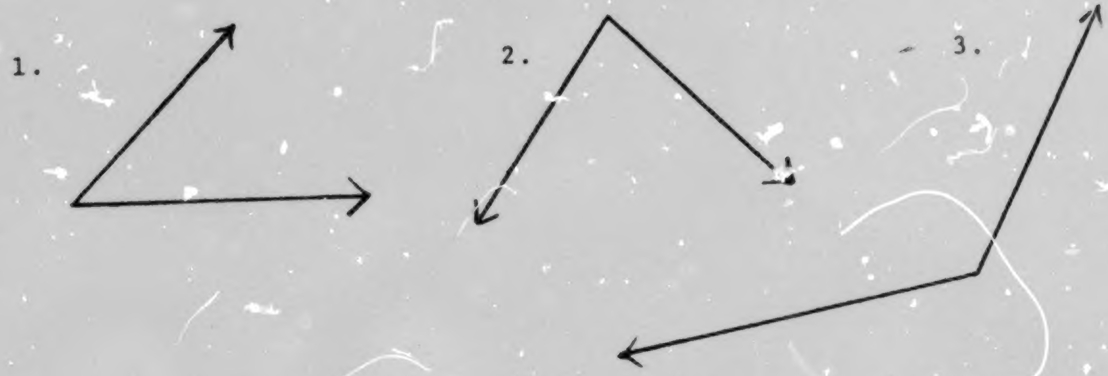
1. The temperature at 4 a.m. was a) 5° b) 10° c) 15°.

2. The temperature at noon was a) 20° b) $22\frac{1}{2}°$ c) 25°

3. The highest temperature occurred at

a) 6 a.m. b) 3 p.m. c) 12 p.m.

E-148 Use a protractor to measure each of the following angles to the nearest degree.



E-149 1. What is the average of $22 and $42?

2. Five students weighed 50 kilograms, 58 kilograms, 52 kilograms, 44 kilograms, 62 kilograms. What is their average weight?

E-150 Write the number sentence for and solve each of the following.

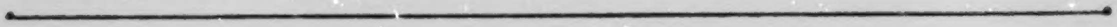
1. Mrs. Carr started her car trip from Middletown to Des Moines at 8:15 a.m. The trip took 2 hours and 20 minutes. When did she arrive in Des Moines?

2. Rae needs 4 pieces of board, each $1\frac{1}{4}$ feet long, from a 6 foot board. What is the length of the extra piece?

F-151 1. Write the measure of the line segment below:

a) to the nearest $\frac{1}{16}$ inch.

b) to the nearest millimeter.



2. Write each of the following as a decimal fraction. (Example: 2 meters and 25 centimeters = 2.25 m.)

a) 15 centimeters and 8 millimeters = __________ centimeters.

b) 126 centimeters = __________ meters.

c) 228 millimeters = __________ centimeters.

F-152 Write the measurements below in order from the most precise to the least precise.

155 meters, 42 millimeters, 1.31 meters, 4.5 millimeters

F-153 Complete each of the following.

1. $1\frac{1}{2}$ feet = ________ inches = ________ yard

2. $1\frac{1}{2}$ meters = __________ centimeters.

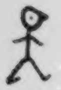
3. $2\frac{1}{2}$ hours = _________ minutes.

4. $20\frac{1}{2}$ grams = __________ milligrams.

5. $20\frac{1}{2}$ grams = __________ kilograms.

F-153a

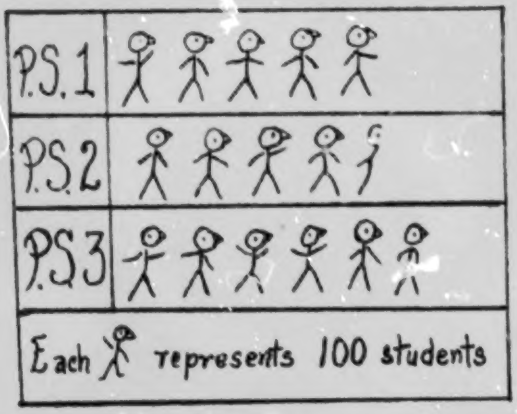
1. Estimate the temperature of this room in degrees F. In degrees C.
2. Estimate the temperature of the outdoors in degrees F. in degrees C.

F-154 1. If a "stick" figure  on a graph is drawn to represent 10 students in a school, how many stick figures would be drawn to represent 120 students?

2. Draw a circle graph to illustrate the following data.

In our household budget, one-fourth goes for food, one-third for shelter and household expenses, one-fourth for car and other transportation costs, with the remainder for recreation and savings.

F-155

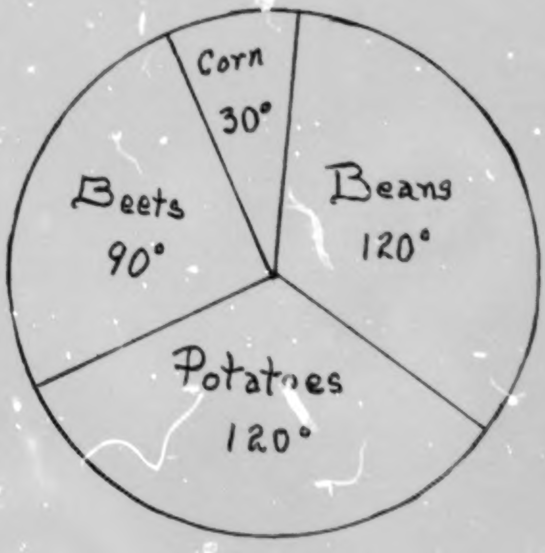


1. What is the enrollment of P.S. 1?

2. What is the enrollment of P.S. 2?

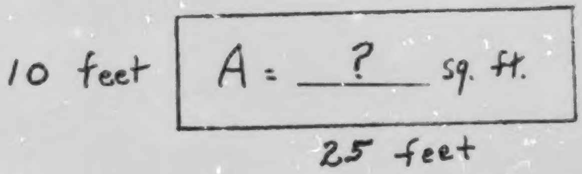
3. What portion of the truck garden is planted in beets?

4. About what fraction of the garden is planted to potatoes?



Circle Graph of
a
Truck Garden Planting

F-156 1. What is the area of the rectangle pictured?

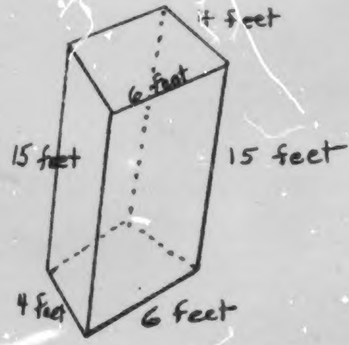

10 feet
A = ? sq. ft.
25 feet

2. What is the area of the rectangle whose length is 15 meters and whose width is 8 meters?

A = __________ square meters.

F-157 1. What is the volume of the box (rectangular prism), pictured here?

V = __________ cubit feet


4 feet
6 feet
15 feet
15 feet
4 feet
6 feet

2. What is the volume of a rectangular prism whose length is 12 meters, whose width is 5 meters and whose thickness (or depth) is 3 meters?

V = __________ cubic meters

F-158 1. Find the length from the formula A = 1. w. when

A = 60

and w = 5.

2. Find the height from the formula A = 1. w. h, given

A = 960

1 = 8

and w = 6.

F-159 Complete each of the following. Write the simplest form of the answer.

1. 5 quarts 2 pints
+3 quarts 3 pints

2. 5 quarts 2 pints
-3 quarts 3 pints

3. 2 pounds 10 ounces
+1 pound 8 ounces

4. 4 pounds 5 ounces
-2 pounds 8 ounces

F-160 Complete each of the following. Write the simplest form of the answer.

1. How much time is 2 x (3 hours and 40 minutes)?

2. How much time is $\frac{1}{2}$ of 3 hours and 40 minutes?

3. 5 x (2 feet 5 inches) = ____?____ .

4. 3 x 4.54 meters = ____?____ .

5. 4 x (4 pounds 5 ounces) = ____?____ .

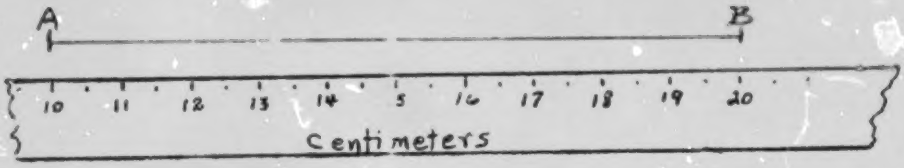
F-161 (Multiple choice)

Mass is: a) the quantity of matter of a given object.

b) the volume of an object.

c) weight of an object.

F-162



1. Multiple Choice. Select the best answer.

   a) Segment AB is exactly 10 cm long.
   b) Segment AB is exactly 10.2 cm long.
   c) Segment AB is exactly 20 cm long.
   d) Segment AB is approximately 10.2 cm long.

2. Multiple Choice. Select the best answer.

   a) Measurement is always exact.
   b) Measurement is always approximate.
   c) Measurement is usually exact.
   d) Measurement is usually approximate.

F-163 (Use the upper corner (1-10) of the square root table, page 595 of my geometry text.)

N	$\sqrt{N}$	$\sqrt{10N}$
1		
2		
⋮		
10		

Table I

USE FEDERAL INCOME TAX FORM in Applied Math text (Auto Mech. has one).

Use only 0 & 1 exemptions ____________

Need heading:

"Weekly Income Tax Withholding"

Table II

1. Use Table I to name $\sqrt{5}$. ____________

2. Use Table I to name $\sqrt{20}$. ____________

3. Use Table II to name the amount subtracted (exempted) from gross wages, using one exemption and a weekly salary of $75.

   ____

4. Use Table II to name the percentage used to multiply the remainder by for a weekly salary of $185.32 and no exemptions.

   ____

F-164 Use a protractor to determine the sum of the measures of the angles of the figure below.

M∠A = ______

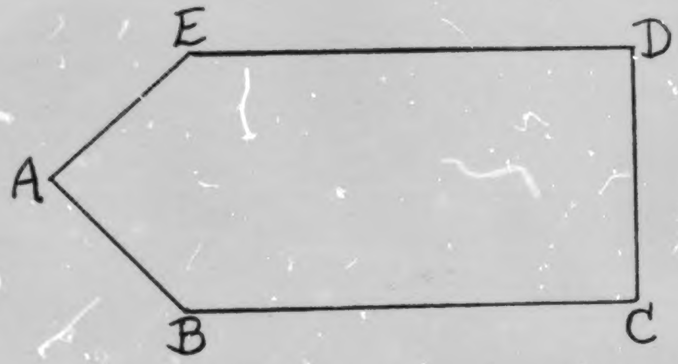
M∠B = ______

M∠C = ______

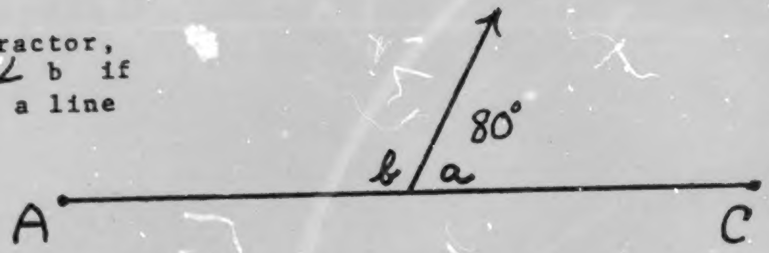
M∠D = ______

M∠E = ______

Total ______



F-165 Without using a protractor, name the measure of ∠ b if M∠a = 80° and $\overline{AC}$ is a line segment.



F-165a The circumference of a circle is

a. the length of the circle

b. its area

c. its diameter

d. its radius

F-166 The circumference of a circle divided by the length of the diameter $\left(\frac{C}{d}\right)$ is approximately what number?

______

F-167 Name the circumference of the circle whose diameter is 10 meters long.

F-168 Write the number sentence for and solve each of the following.

1. A homemaker wanted to fit some furniture against a $11\frac{1}{2}$ foot wall of the living room. The couch is $5\frac{3}{4}$ feet long and the two matching chairs are each $3\frac{1}{3}$ feet wide. Can this person place all three pieces along this wall?

2. A man decides to paper two walls of a bedroom. The walls are 8 feet high. One is 10 feet long and the other is 12 feet long, with a 3 x 5 foot window. How much wall space is to be covered, in square feet?

3. Two boxes (rectangular prisms) have the following dimensions:

   A: 1.5M x 1.2M x 1.3M
   B: 2.1M x 1.2M x 0.8M

   What is the difference in storage space of the two boxes, in cubic meters?

F-169 Multiple Choice - Use mental approximations only!

1. 4,835 + 729 + 1,024 + 970 is approximately:

   a) 8,000
   b) 7,000
   c) 5,000.

2. $3\frac{3}{4} + 7\frac{2}{3} + 5\frac{1}{2} + 12\frac{1}{8}$ is approximately:

   a) 27
   b) 28
   c) 29.

3. 1,009.99 + 4,123.12 + 698.01 + 212 is approximately:

   a) 10,000
   b) 6,000
   c) 140,000

LOGIC AND SETS STRAND

1979 Mathematics (K-8) Performance Objectives

Test Items

Logic and Sets Strand

Materials: Set(s) of attribute blocks (commercial or teacher-made); colored beads/blocks; counters, such as beans, checkers, etc.

K-1 Make a shape-block/colored block pattern for child to reproduce (copy).

Examples: ○□○□○□○□, ○○□□○○□□○○□□, ○□△○□△○□△, ○□△●○□△●○□△●.

K-2 Start a pattern as in K-1 for child to extend/build a pattern with missing elements for child to insert.

K-3 Place a set of attribute blocks, plastic cars, etc., in front of child. Have child place these in subsets (in boxes or rings of yarn) on the basis of size, form, color, class, or function. (Teacher: "Place all the squares in one circle and triangles in another circle." or "Place all the trucks in one parking lot and the passenger cars in another.")

K-4 Place two sets ($\leq$ 10 objects each) of complementary objects (straws to pop bottles, dolls to dresses, flowers to flower vases, etc.) in front of child for 1-to-1 matching. (Teacher: "Is there a flower for each vase?")

K-5 Place two sets of objects ($\leq$ 10 each) of the same type (large and small milk cartons, pictures of adults and children, etc.) in front of child for 1-to-1 matching.

K-6 Place two sets of ($\leq$ 10 each) of unlike objects (marble, pencil, ring, cup, square, etc.) in front of child for 1-to-1 matching.

K-7 Place a set of objects in front of child, arranged in a variety of configurations. Ask child to form a matching set (1-to-1) from other available objects.

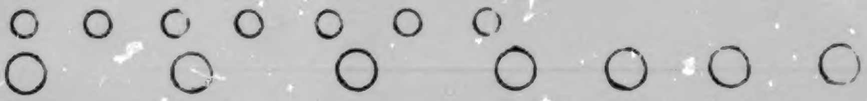
K-8 Place two non-equivalent sets ($\leq$ 10 each) of counters in front of child, arranged in a variety of configurations. Ask child which set has the greater/lesser number of items, and how many more/less. (Allow use of 1-to-1 correspondence but do not force this.)

K-9 Place a set of objects $\leq$ 9 in front of child. Have child form another set with exactly one more member. (Allow use of 1-to-1 correspondence.)

A-10 Place a set of objects ≤ 10 in front of child. Have child form another set with exactly one less member.

A-11 Place a set of counters ≤ 10 in front of child. Have child name the number of counters. Arrange set in a variety of configurations, asking: "Is the number more than, the same as, or less than before?"

Example:



If the child relates length (or shape) to number, (s)he is not ready for number activities: counting, addition, etc. (Child does not conserve the number property of a set of objects.) If the child wants to recount the objects (s)he probably does not conserve number.

A-12 Place a set of counters ≤ 10 in front of child. Ask child the number (property) of the set. Separate the set into two subsets. Ask child the total number (property) of the two subsets. (conservation of number and subtraction readiness.)

A-13 Have lima beans (etc.) glued to pieces of oaktag or wood strips in sets of one, two, three, ... ten. Have child arrange these sets from least to greatest (or conversely). (Numeral names for the sets could be printed on the back of the oaktag.)

A-14 Starting with sets of one through five counters show child the set for quick verbal identification. Don't give time to count the set. Teacher: "Tell me how many without counting." (Show child sets of one through five counters for quick verbal identification.)

A-15 Place a set ≤ 10 of attribute blocks in front of child. Have child arrange in subsets using 2, or 3 properties simultaneously. (e.g.: color and shape; color, shape, and size; etc.) Teacher: "Form a set of large red blocks." "Form a set of thin, blue, triangles." (Checking logic level and multiplication readiness.)

B-16 See A-13. Have sets of one through 25.

B-17 Complete the following number patterns.

1. 3, 4, 5, ________, ________.
2. 12, ________, ________, ________, 16, 17.
3. 19, ________, ________, ________, 23
4. 2, ________, 6, ________, 10

B-18 Place a set of attribute blocks ≤ 10 in front of the child and ask them to verbally name the properties common to all members of that set. (e.g.: rectangles (includes squares), large, small, thick, then, blue, triangles, etc.)

C-19 Complete the following number patterns.

1. 1, _______, 5, _______, 9

2. _______, 6, 9, _______, 15

3. 21, 19, _______, _______, 13

4. 30, 22, _______, 14, _______, 6

5. 2, 4, 7, _______, 16

C-20 See A-15. Suggested combinations of attribute blocks: Large, blue triangles; small, green, rectangles (including squares); large, yellow, circles; small, thin, red, circles; etc.

Sets of plastic cars: two-door, red, passenger cars; green, panel trucks; etc. Consider asking the inverse question: "What are the attributes of the set having the greatest/least members?"

D-21 Complete the following number patterns.

1. 19, 17, _______, _______, 11.

2. 7, 12, _______, 22, _______.

3. 64, 32, 16, _______, _______.

4. 1, 2, 3, 5, 8, _______, _______.

E-22 Complete the following number patterns.

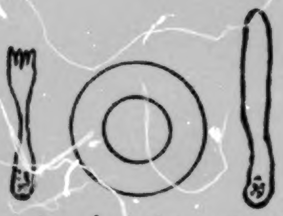
1. 1, 3, 6, 10, _______, _______.

2. 4, 7, 5, 8, 6, _______, _______.

3. 1, 3, 9, 27, _______, _______.

4. 18, _______, 11, 9, 8.

E-23



Circle the correct words (right of, left of) below.

1. The knife is (right of, left of) the plate.

2. The knife is (right of, left of) the fork.

3. The fork is (right of, left of) the knife.

4. The fork is (right of, left of) the plate.

5. The plate is (right of, left of) the fork.

E-24 Complete the following statements logically.

(Example: Half of the number 8 is 4 because ... 4 + 4 or 2 x 4 is 8.)

1. The number 10 is an even number because ______________________________

____.

2. Six is not a prime number because ______________________________

____.

E-25 Complete the following statements logically.

1. It is 12 o'clock and the sun is not shining; therefore ______

____.

2. 2 + 3 = 5 and 1 + 4 = 5, therefore ______________________________

____.

F-26 Complete the following number patterns.

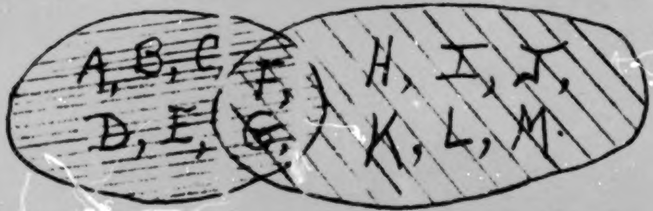
1. 81, 27, 9, ________, ________.

2. 3, 4, 6, 9, 13, ________, ________.

3. 5, ________, 13, ________, 21.

4. 2, 2, 4, 12, 48, ________.

F-27 1. Name the intersection set pictured in the following Venn diagrams.



2. Use Venn diagrams to picture the intersection of set A and set B:

$$A = \{2, 4, 6, 8, 10, 12\},$$

$$B = \{3, 6, 9, 12, 15, 18\}.$$

F-28 Use Venn diagrams to picture the union of set C and set D:

$$C = \{1, 2, 5, 6, 9, 10\},$$

$$D = \{3, 4, 7, 8, 11, 12\}.$$

F-29 Write a counterexample to disprove each of the following statements.

1. All school houses are two-story buildings.

2. All integers are positive whole numbers.

NUMERATION

1979 Mathematics (K-8) Performance Objectives
Test Items

Numeration

Materials: Set of counters. Set of "ten-sticks"/bundles of ten

K-a Show the child a numeral card 0-6. Have the child name the numeral and form a set having this number property.

K-b Show the child a set of objects ___ 6. Have the child select and name the numeral card that matches the set.

K-c Repeat K-a with numerals 7-12.

K-d Repeat K-b with numerals 7-12.

A-1 Show the child a set of objects ___ 10. Have the child name and write the numeral that matches the set.

A-3 Have the child build a set of 10 and 1, through 10 and 9, as you state and write the teen numerals.

A-4 Show the child models (10 beans glued to a tongue depressor, etc. plus separate beans) of each teen number. Child names and writes numerals for each.

A-5 Child writes as teacher dictates a subset of the set of numerals 0-20, in sequence/random order.

A-6 Complete the blanks.

11 = 10 + ____ 18 = 10 + ____ 19 = 10 + ____

14 = 10 + ____ 16 = 10 + ____ 15 = 10 + ____

17 = 10 + ____ 13 = 10 + ____ 12 = 10 + ____

A-7 Have the child arrange in order a set/subset of prepared numerals 0-20.

A-8 Show the child two numerals 0-20. Ask child to name the numeral which denotes the greater/lesser number. Child occasionally uses objects to demonstrate.

A-9 Have the child point to and orally name the position (first, second, etc.) of an object in a line of $\leq$ 20 objects.

A-10 Place a set of objects ($\leq$ 20) in front of child. Have child name orally and select the numeral for the set. Separate some objects from the set. Child names orally and selects the numeral for each of the two sets. (Subtraction readiness.)

A-11 Place two sets of objects ($\leq$ 10 each) in front of child. Child orally names and selects the numeral for each set. Join the sets. Child orally names and selects the numeral for this join. (Addition readiness)

A-12 Child writes and names the numerals between a pair on a card shown by the teacher, or by using the following:

1. 7, __________, 9

2. 11, __________, 13

3. 18, __________, 16

4. 18, __________, 20

A-13 Child writes and names the predecessor and successor of a numeral on a card shown by the teacher, or by using the following:

(1) __________, 6, __________

(2) __________, 11, __________

(3) __________, 1, __________

(4) __________, 19, __________

A-14 Have child form sets of 10 (stick bundles, bean sticks, etc.) and orally name the number of tens formed.

A-15 Show the child a numeral (10, 20, 30, ..., 90) and have child select the sets of ten this numeral denotes.

A-16 Show the child sets of 10 (10, 20, 30, ..., 90), then child writes numeral denoting this set.

A-17 Teacher hears child count orally by ones through 100, or on tape recorder.

A-18 Procedure: Instruct the student to write the symbol < or > between the numerals which makes the sentence true. When completed, ask the child to read the sentence (s) to you.

(1) 1 2

(2) 5 3

(3) 7 4

(4) 8 9

(5) 11 5

(6) 13 10

(7) 7 14

(8) 20 12

A-19 Materials: Color code cards (1-9), 10 & 20, teens, etc.
Set of cards with the words one through twenty. (one word on each card)

Procedure: Shuffle the cards and place them in front of the child. Ask the student to choose a card(s), read the word to you and write the numeral on his paper.

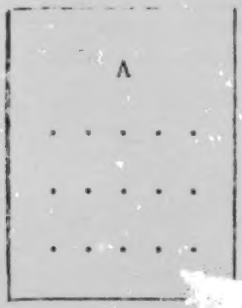
twenty 20

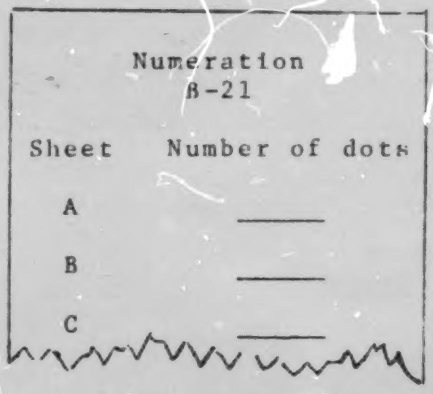
B-20 Materials: Set of cards with numerals 10-99 (one each).
9 - bean sticks with 10 beans glued to each and 9 separate beans.

Procedure: Place the cards, sticks and beans in front of the child.
Ask the child to select a numeral card, and show you the correct physical model (number) for the numeral.

B-21 Materials: Dotter sheets with arrays containing 20-100 dots

Procedure: Ask the student to select (or select for him) a set of 10 arrays and write the numeral naming the number of dots.





Numeration
B-21

Sheet	Number of dots
A	______
B	______
C	______

B-22 Materials: A hundreds board or chart.

Procedure: Remove or block out the first n numerals. Ask the child to read to you the numerals n + 1 to $\leq$ 100, in order.

B-23
B-24
B-25
B-26

Materials: Cassette tape recorder (optional)

Procedure: Set the recorder to record. Instruct the student in the use of the off/on switch on the microphone. "When I say start, turn the switch to "on" and count to 100 into the microphone:

(B-23) by 10's starting with 10;
(B-24) by 2's, starting with 2;
(B-25) by 5's, starting with 5;
(B-26) count to 30 by 3's, starting with 3;

(If a recorder is not available the student may count orally to the teacher.)

B-27 Write the numeral following the word(s).

1. eighteen ______________
2. twenty-seven ______________
3. forty-three ______________
4. eighty-nine ______________
5. one-hundred ______________

B-28 Write the word name for the given numeral. (Student reads the word orally to the teacher, as requested.)

1. 17 __________

2. 50 __________

3. 34 __________

4. 98 __________

5. 41 __________

B-29 Write the numbers before and after the given number.

Example: 26, 27, 28

1. __________, 14, __________

2. __________, 21, __________

3. __________, 68, __________

4. __________, 79, __________

5. __________, 99, __________

B-30 Write the number that is between the two named.

1. 12, ____________, 14

2. 29, ____________, 31

3. 40, ____________, 42

4. 76, ____________, 78

5. 98, ____________, 100

B-31 Write the numerals that best fill the blanks.

1. 18, ____, ____, ____, ____, 23

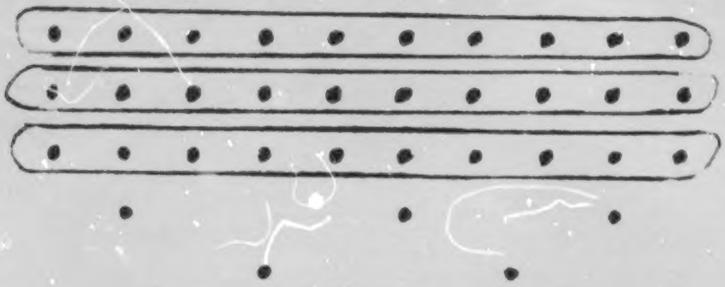
2. ____, ____, 10, ____, 12

3. ____, 30, ____, 32, ____

4. ____, ____, ____, 62, 64

5. 77, ____. ____, ____, 81

B-32 1.



How many beans (dots) ?

Circle the best answer

a) 40 b) 53 c) 35

2. 57 means _______ tens and _______ ones.

3. Circle the correct answer.

84 means a) 8 tens b) 80 tens c) 84 tens

B-33 Circle the best answer.

1. 80 + 9 is another name for

a) 89 b) 98 c) 809

2. The numeral 23 can be written as:

a) 2 + 3 b) 20 + 3 c) 2 + 30

3. The numeral 78 can be written as:

a) 70 + 8 b) 7 + 8 c) 7 + 80

4. The numeral 46 names:

a) 6 tens and 4 ones

b) 40 tens and 6 ones

c) 4 tens and 6 ones

B-34 Write > or < in the blank to make a true statement.

1. 22 __________ 19

2. 50 __________ 47

3. 100 __________ 99

B-35 1. Circle the even numbers.

5, 8, 13, 26, 44, 69

2. Circle the odd numbers.

7, 9, 14, 55, 74, 99

B-36 Materials: Children

Procedure: Place a small group of children in a line.
e.g. Terry John Sue etc.
"Terry is the first in the line."

Fill in the blanks.

1. John is the _____________ in the line.
2. Henry is the _____________ in the line.
3. etc.
4. ↓
5.

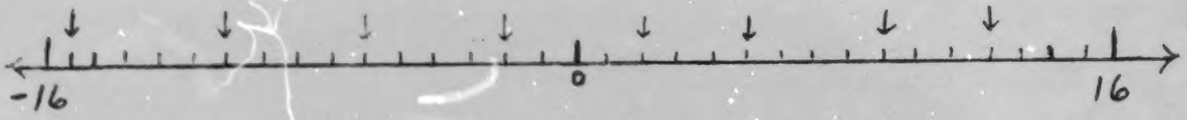
B-37 Materials: Make a set of cards with each of the following numerals on a different card.

Procedure: Ask the child to match the numeral cards. Could list the numerals on a piece of paper, then draw a line joining numerals having the same value.

1	II
2	V
3	X
4	IX
5	XI
6	III
7	I
8	IV
9	VI
10	XII
11	VII
12	VIII

B-38 Materials: Number line below.

Procedure: Label the indicated points with the proper numerals.



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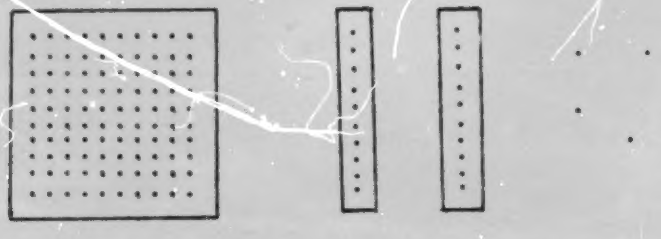
C-39 Write the numeral naming the number of dots in each of the following pictures.

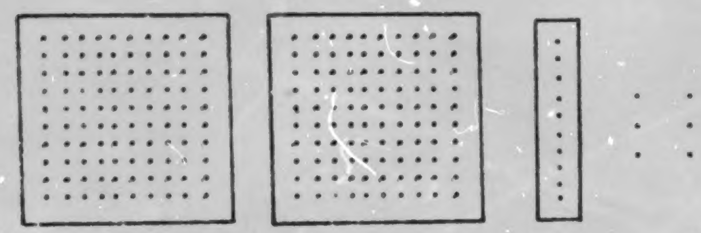
1.



100 board ten-sticks

____
number

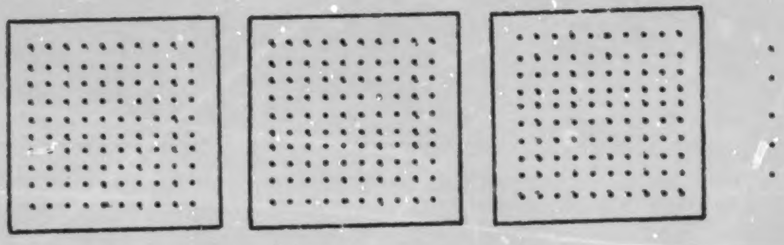
2.



100 boards

____
number

3.



100 boards

____
number

C-40 Materials: Tape recorder (if available)

Procedure: Set the recorder to record, instruct the student that when you say "begin" to move the microphone button to "on". Start with 100 and count to 200, by ones.

C-41 Same as C-40

Start at 200 count by 10's, start at 100.

C-42 Materials: Paper and pencil

Procedure: Instruct the student(s) to name the place value of each digit in 765

a) ____________

b) ____________

c) ____________

and to read orally each name to the teacher.

C-43 Circle the best answer.

1. 200 + 40 + 6 is another name for

   a) 200406 b) 246 c) 642

2. The numeral 853 can be written as

   a) 8 + 5 + 3 b) 80 + 53 c) 800 + 50 + 3

3. The numeral 123 names

   a) 12 tens and 3 ones

   b) 1 one-hundred and 23 tens

   c) 3 tens and 12 one-hundreds

C-44 Procedure: Ask the student to write the word name for each numeral below.

1. 18 ______________

2. 101 ______________

3. 597 ______________

4. 70 ______________

5. 81 ______________

6. 400 ______________

7. 740 ______________

8. 11 ______________

C-45 Materials: hundreds squares
tens strips or bean sticks
one's spots or beans

Procedure: Instruct the student to show you a model for the numerals below:

1. 13 2. 40 3. 105 4. 184 5. 190

C-46 1. Circle the even numbers in the following list.

11, 18, 25, 30, 42, 66, 89

2. Circle the odd numbers in the following list.

2, 5, 15, 20, 33, 72, 90

C-47 Materials: Tape recorder (if available)

Procedure: Instruct the child in the use of the recorder. Count to 1000 by 100's starting with 100.
Begin

C-48 Materials: Tape recorder (if available), or pencil and paper.

Procedure: Read the following word names into the recorder (or to the student(s)) at 20 second intevals. Instruct the student to write the numeral.

Write the corresponding numeral for each word name below:

Numeral

1. five hundred seventy-six ____________________
2. three hundred seven ____________________
3. nine hundred ten ____________________
4. six hundred sixty-four ____________________
5. nine hundred fifty-eight ____________________

C-49 Instruct the student to write the word name for the numerals

1. 578 or ____
2. 300 or ____
3. 790 or ____
4. 709 or ____
5. 942 or ____

C-50 Circle the best answer.

1. Which is nearest 462?

a) 460 b) 470

2. Which is nearest 254 + 646?

a) 250 + 640 c) 260 + 640

b) 250 + 650 d) 260 + 650

C-51 Instruct the student to write < or >, between the numerals to indicate the correct relationship.

1. 54 72 3. 710 701

2. 986 689 4. 399 400

C-52 **Materials:** Cards with numerals (color coded multiples of 10, 100 for teacher choice) 0 through 1000.

Procedure: Choose a subset of the cards and ask the student to arrange them in increasing/decreasing order.

C-53 **Materials:** Pencil and paper

Procedure: Instruct the student to write the numeral preceding and following the given numeral.

Example: 477, 478, 479

1. __________, 596, __________

2. __________, 500, __________

3. __________, 730, __________

4. __________, 299, __________

5. __________, 703, __________

C-54 Instruct the child to name the whole number between the two named.

1. 333, __________, 335

2. 922, __________, 924

3. 700, __________, 702

4. 890, __________, 892

5. 299, __________, 301

C-55 Instruct the student to write the (Arabic) numeral that compares with the Roman Numeral.

XX __________

V __________

III __________

X __________

XV __________

I __________

XIII __________

VII __________

XVIII __________

XIX __________

II __________

XIV __________

IX __________

XVIII __________

XII __________

IV __________

XVI __________

VI __________

XI __________

VIII __________

C-56 Ask the student to write the simplest name for (evaluate) the expressions below.

1. 5 + (3 x 2) = ________

2. 5 + (3 + 2) = ________

3. (5 + 3) x 2 = ________

4. (5 x 3) + 2 = ________

D-57 & D-58 Materials: Tape recorder if available

Procedure: Listen to the child directly or instruct the child in the use of the recorder.

"Say your name into the recorder."

Count to 10,000 by thousands, begin

Count to 10,000 by one-hundreds, begin

D-59 Materials: Tape recorder or worksheet with the following word names.

Procedure: Record the word names below or read orally to the student.

Ask him to write the numeral.

1. seven thousand, three hundred ninety-two
2. six thousand, forty-five
3. five thousand, seven
4. five thousand, seven hundred
5. five thousand, seventy

D-60 Ask the student to write the word name for each numeral below. When (s)he has completed the list ask her/him to read the list to you.

1. 5,876 ____

2. 3,089 ____

3. 6,250 ____

4. 2,090 ____

5. 7,376 ____

D-61 Ask the student to write the simplest name for the following expressions.

1. 2 + 3 + (4 x 5) = ________

2. 2 + 3 + (4 x 5) = ________

3. 2 x 3 + (4 + 5) = ________

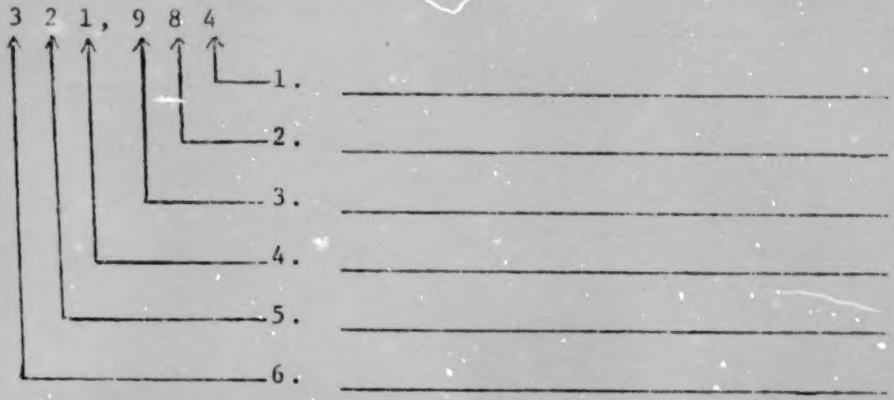
4. (2 + 3) x (4 + 5) = ________

D-62 Rearrange each of the following sets of numerals from least to greatest.

1. 8056, 10,000, 7000, 9876, 7903. ____________________

2. 2098, 2200, 2009, 999, 2222. ____________________

D-63 Name the place value of each digit in the numeral



(The child will orally read each name for the teacher.)

D-64 1. Circle the correct answer. 36,702 can be renamed as:

a) 3000 + 6000 + 700 + 2

b) 30000 + 6000 + 70 + 2

c) 30000 + 6000 + 700 + 2

d) 3 + 6 + 7 + 0 + 2

2. Rename 456,789 using expanded notation.

____

D-64a Circle the correct answer

1. The simplest name for 8000+ 7 + 600 is

a. 876

b. 867

c. 8607

d. 8760

2. The simplest name for 500 + 30,000 + 9000 + 40 + 8 is

a. 35,948

b. 39,548

c. 53,948

d. 95,348

D-65 1. How can you determine an even number?

____

2. How can you determine an odd number?

____

D-66 Student writes the numerals for three word names selected at random from a set of cards prepared by the teacher with word names from 10,000 to 100,000, or uses the following list:

1. ten thousand, one hundred ninety-three ______________

2. ninety thousand, fifty-five ______________

3. one hundred thousand, nine hundred eight ______________

D-67 Student writes the word names for three numerals selected at random from a set of cards prepared by the teacher with numerals from 10,000 to 100,000, or uses the following list:

1. 19,870 ________________________

2. 25,043 ________________________

3. 90,705 ________________________

D-68 Circle the best answer.

1. Which is nearest 6,758?

a) 6750 b) 6760

2. Which is nearest 6,758?

a) 6700 b) 6800

3. Which is nearest 608 + 297?

a) 600 + 200 b) 600 + 300 c) 700 + 300

4. Round off 5786 to the nearest

a) ten ____________________

b) one-hundred ______________

D-69 Circle the prime numbers below.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10.

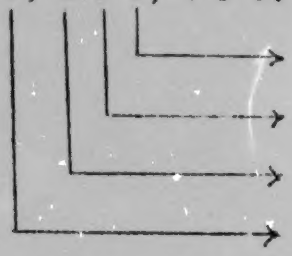
D-70 Circle the composite numbers below.

1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14,
15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26,
27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38,
39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50.

D-71 Materials: Tape recorder if available

Procedure: Listen to the child directly or have child use the tape recorder to count to 1,000,000 by one hundred thousands, starting with 100,000.

E-72 Name the place value of each indicated digit in the numeral 9, 1 2 3, 4 5 6.



1. ______________________

2. ______________________

3. ______________________

4. ______________________

E-73 Use expanded notation to rename the following: (Example: 526 = 500 + 20 + 6)

123,456 ______________________________________

E-74 Write the word name for each numeral.

1. 54,320 or ____

2. 907,056 or ____

Read the names to the teacher.

E-75 Student writes the numerals for two word names selected at random from a set of cards prepared by the teacher with word names from 100,000 to 1,000,000, or uses the following list:

1. six hundred fifty thousand, one hundred twenty-eight.

2. one million, seventy thousand, fifty-five

E-76 Circle the best answer in Exercises 1, 2.

1. Which is nearest 768,451?

a) 768,000 b) 769,000

2. Which is nearest 125,650?

a) 120,000 b) 130,000

3. 'Round' 546,555 to the nearest thousand. ____________

E-77 Name the whole number before and the whole number following each of the listed numbers.

1. ____________ 906,720 ____________

2. ____________ 700,000 ____________

E-78 Name the whole number between each of the listed numbers.

1. 570,428 ____________ 570,430

2. 670,001 ____________ 669,999

E-79 Which of the following are true?

1. 780,000 > 779,999 T - F

2. 999,999 < 1,000,000 T - F

E-80 Circle the prime numbers in the following set.

2, 9, 17, 31, 43, 51

E-81 Circle the composite numbers in the following set.

10, 11, 19, 21, 59, 77

F-82 What is the common name of the following set?

{0, 1, 2, 3, 4, 5, ...} ____________

F-83 1. List the set of odd numbers < 10. ____________

2. List the set of even numbers > 10 and < 20.

____

F-84 1. The temperature was 5°C at midnight, then dropped 10 degrees by morning. What is the morning reading? ____________

2. I had forgotten that my bank balance was only $360 just before I wrote a $400 check. What is my new balance? ________

F-85 Which of the following are true?

1. $^{-}8 > 4$ True - False

2. $^{-}50 > {}^{-}25$ True - False

3. $^{-}3 \neq 3$ True - False

F-86 Student writes the numerals for two word names selected at random from a set of cards prepared by the teacher with word names from 1,000,000 to 1,000,000,000, or uses the following list:

1. fifty-one million, seventeen thousand, thirty-one

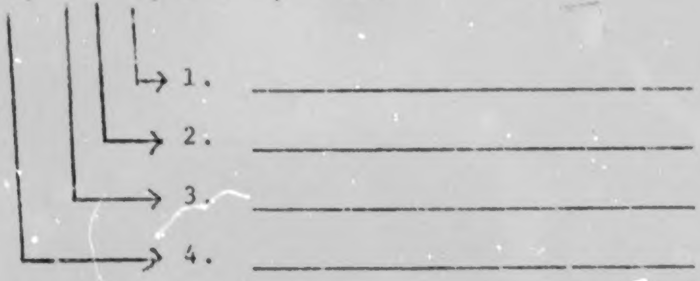
2. eight hundred five million, three hundred thousand

F-87 Write the word names for each of the following.

1. 467,103,928 ____________________

2. 905,010,042 ____________________

F-88 Name the place value of each indicated digit in the numeral
1, 4 3 2, 5 6 7, 8 9 0



F-89 1. Write a number greater than 9,000,000,000.

2. Write a number greater than 999,999,999,999.

3. What is the greatest number anyone can write?

WHOLE NUMBERS: ADDITION-SUBTRACTION STRAND

1979 Mathematics (K-8) Performance Objectives

Test Items

Whole Numbers: Addition-Subtraction Strand

A-1 Place 4, 6, 12, 9, 5 (etc.) counters on the child's desk or on the overhead projector (three exercises are sufficient). Ask the student to write the number sentence showing what happened (e.g. 7 + 1 = 8).

A-2 Same procedure as A-1 except one member is separated from the set. Writes 7 - 1 = 6, etc.

A-3 Use counters on child's desk/overhead projector to show the following (and other examples):

1. o o "Add (join) objects to this set to make the total 9.
o Write the number sentence telling what happened."
o o

2. * * "Add objects to this set to make the total 8. Write
* the number sentence telling what happened."

A-4 As in A-3

1. o o o o "Separate enough objects from this set to leave
o 5. Write the number sentence telling what hap-
o o o o pened."

2. * * * * "Separate enough objects from this set to leave
* * * * 7. Write the number sentence telling what hap-
* * * pened."

A-5 As in A-3

"Write the number of each set and of the join ("addition") of the two sets."

1. o o
o *

____ + ____ = ____

3. * oooo

____ + ____ = ____

2. oo oo

___ + ____ = ____

4. * * *
* *

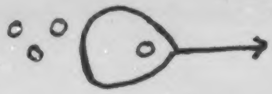
___ + ____ = ____

A-6 As in A-5

"Write the number of the original set, the number separated from this set, and the number remaining."

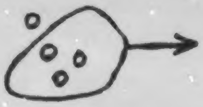
Suggestion: Show the number of counters on an overhead, then slide a card slowly under several of them to accomplish the "separation."

1.



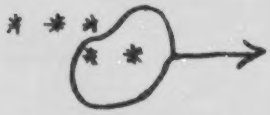
______ - ______ = ______

3.



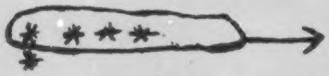
______ - ______ = ______

2.



______ - ______ = ______

4.



______ - ______ = ______

A-7 Given the number sentences below and a set of counters, ask the student to read the sentences, illustrate the join with counters, then write the sums.

1. 3 + 2 = ______

2. 2 + 3 = ______

3. 4 + 1 = ______

4. 1 + 4 = ______

5. 0 + 3 = ______

6. 5 + 4 = ______

7. 2 +7 = ______

8. 6 +2 = ______

A-8 Given the number sentences below and a set of counters, ask the student to read the sentences, show the set separation 13 - 8 = ______ with the counters, then state the number of counters remaining.

1. 5 - 2 = ______

2. 7 - 3 = ______

3. 9 - 6 = ______

4. 8 - 4 = ______

A-9 Place counters on the child's desk or on the overhead projector. Ask the student to write the number sentence showing what happened (e.g. 7 + 6 = 13, 8 + 7 = 15)

A-10 Same procedure as A-9 except one number is separated from the set. Writes 17 - 8 = 9, etc.

A-11 Ask student to read, then illustrate using objects:

3 + 3 = ________ 10 + 2 = ______

4 + 5 = ________ 9 + 2 = ______

5 + 2 = ________ 8 + 1 = ______

7 + 0 = ________ 1 + 7 = ______

A-12 Ask student to read, then illustrate using objects:

9 - 6 = ______ 11 - 4 = ______

7 - 7 = ______ 10 - 6 = ______

8 - 3 = ______ 13 - 5 = ______

A-13 Ask the student to complete the sentence so the sentence is true. When the student has completed the exercises he should read the sentences to the teacher and explain how he arrived at his answer. No mention of the word "commutative" need be made.

1. 4 + 3 = 3 + ________ 4. 5 + 0 = 0 + ________

2. 7 + 6 = 6 + ________ 5. 8 + 2 = 2 + ________

3. 5 + 8 = 8 + ________

A-14 Place =, -, + next to the correct words. (Teacher reads words with the student.)

greater than ________ plus ________

equals(s) ________ less than ________

is equal to ________ minus ________

B-14a Add

1) 10 + 5 = ______
2) 10 + 7 = ______
3) 3 + 10 = ______
4) 6 + 10 = ______
5) 10 + 9 = ______

B-15 Ask the student to find the sums. (Use counters if needed.)

1. 7 + 6 = ______
2. 13 + 3 = ______
3. 9 + 9 = ______
4. 9 + 7 = ______
5. 6 + 5 = ______

6. 11
+ 5
______

7. 8
+ 4
______

8. 14
+ 4
______

9. 8
+ 8
______

10. 4
+ 9
______

B-15a
1) 25
+3
___

2) 51
+8
___

3) 44
+5
___

4) 93
+4
___

5) 86
+2
___

B-15b
1) 10 - 5 = ______
2) 10 - 9 = ______
3) 10 - 3 = ______

4) 10
-6
___

5) 10
-2
___

B-16 Direct the student to write the differences. (Use counters if needed.)

1. 10 - 3 = ________

2. 14 - 7 = ________

3. 16 - 5 = ________

4. 13 - 3 = ________

5. 16 - 9 = ________

6. 20
$\underline{-\ 9}$

7. 18
$\underline{-\ 8}$

8. 20
$\underline{-\ 4}$

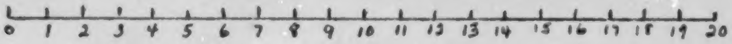
9. 18
$\underline{-\ 9}$

10. 10
$\underline{-\ 7}$

B-17 Materials: Worksheet with 0 - 20 number lines.

Direct the student(s) to illustrate their procedure for finding the differences on the number line.

1. 13 - 6 = ________


0
1
2
3
4
5
6
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8
9
10
11
12
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16
17
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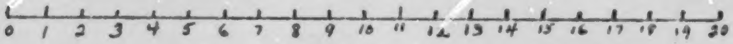
19
20

2. 8 - 3 = ________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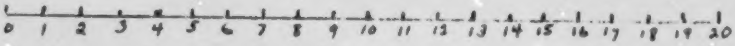
19
20

3. 11 - 7 = ________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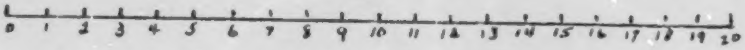
20

4. 12 - 8 = ________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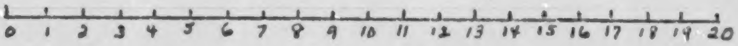
19
20

5. 10 - 4 = ________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17
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19
20

B-18 Write the sums.

1. 3 + 6 + 7 = ________ 2. 5 + 5 + 2 = ________

3. 9 + 0 + 2 = ________ 4. 8 + 3 + 2 = ________

5. 1 + 5 + 9 = ________ 6. 4 + 5 + 1 = ________

7. $\begin{array}{r}6\\4\\+\ 2\\\hline\end{array}$ 8. $\begin{array}{r}9\\7\\+\ 1\\\hline\end{array}$ 9. $\begin{array}{r}5\\4\\+\ 2\\\hline\end{array}$ 10. $\begin{array}{r}9\\9\\+\ 0\\\hline\end{array}$

11. $\begin{array}{r}8\\3\\+\ 6\\\hline\end{array}$ 12. $\begin{array}{r}2\\3\\+\ 2\\\hline\end{array}$ 13. $\begin{array}{r}4\\8\\+\ 3\\\hline\end{array}$ 14. $\begin{array}{r}6\\9\\+\ 3\\\hline\end{array}$

B-19 Complete the number sentences. A variety of answers is possible. Use counters if necessary.

1. _____ + _____ = 19 4. _____ + _____ = 12

2. _____ + _____ = 14 5. _____ - _____ = 12

3. _____ - _____ = 8 6. _____ - _____ = 19

B-20 Read the problem to the student and write the key phrases on the chalkboard as you do so. Use counters if necessary.

1. You have 7 cents. A candy bar costs 10 cents. How much money do you need to buy the candy bar?

(Write: have 7 cents
candy costs 10 cents
how much more do you need?)

2. How many children are in your group. (first row, in the circle, etc.)

How many boys?

How many girls?

How many more (less) boys than girls?

B-21 Complete the following statements.

1. 7 + 0 = ________ 3. 20 - 0 = ________

2. 0 + 12 = ________ 4. 1 - 0 = ________

B-22 Ask the student to write a worded problem which is described by 8 - 5 = ________, etc.

Example: John had eight pieces of gum but gave five to his friends. How many did he have left?

B-23 Write the sums.

1. 5 + (4 + 3) = ________
2. (5 + 4) + 3 = ________
3. (8 + 7) + 5 = ________
4. 9 + (7 + 4) = ________
5. 2 + (6 + 7) = ________

B-24 Write the mathematical symbols for:

1. plus ______
2. minus ______
3. is equal to ______

B-25 Place two sets of objects (total $\leq$ 25) in front of the child. Child writes the number property of set A and of set B, then writes the number property of the join of these sets, set C. See A-5 and B-26.

B-26 Child can write n(A) + n(B) = n(C)

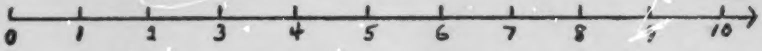
(e.g.: 5 + 3 = 8)

B-27 Given the following (or similar) addition sentences, the student can illustrate the sum by joining sets of objects.

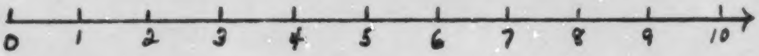
1. 5 + 4 = ________
2. 7 + 3 = ________
3. 8 + 5 = ________
4. 9 + 8 = ________
5. 14 + 6 = ________
6. 12 + 13 = ________

B-28 Illustrate on the number line the solution to each problem.

1. 3 + 4 = ________



2. 5 + 4 = ________



B-29 Write the sum of each of the following.

1. $\begin{array}{r} 12 \\ +\ 23 \\ \hline \end{array}$

2. $\begin{array}{r} 45 \\ +\ 34 \\ \hline \end{array}$

3. $\begin{array}{r} 83 \\ +\ 15 \\ \hline \end{array}$

4. $\begin{array}{r} 78 \\ +\ 20 \\ \hline \end{array}$

5. $\begin{array}{r} 60 \\ +\ 39 \\ \hline \end{array}$

B-30 Place a set (C) of counters $\leq$ 25 in front of the child. Child writes the number of this set. Teacher (or child) then separates the set into two disjoint subsets, A and B. Child writes the number of each subset.

B-31 Child writes n(C) - n(A) = n(B) or n(C) = n(A) + n(B).

(e.g.: 22 - 12 = 10 or 22 = 12 + 10.)

B-32 Write the sums of each of the following.

1 + 2 = ________
2 + 3 = ________
4 + 5 = ________
5 + 6 = ________
6 + 7 = ________
7 + 8 = ________
8 + 9 = ________
9 + 10 = ________
0 + 5 = ________
7 + 5 = ________
3 + 3 = ________
2 + 7 = ________

1 + 9 = ________
4 + 7 = ________
10 + 5 = ________
2 + 10 = ________
10 + 1 = ________
10 + 3 = ________
2 + 4 = ________
5 + 3 = ________
6 + 2 = ________
7 + 3 = ________
4 + 4 = ________

5 + 7 = ________
2 + 8 = ________
3 + 4 = ________
2 + 9 = ________
5 + 5 = ________
6 + 4 = ________
10 + 0 = ________
8 + 8 = ________
3 + 9 = ________
6 + 6 = ________
10 + 10 = ________

2	6	8	10	4	9	3	2
+ 2	+ 3	+ 4	+ 6	+ 9	+ 6	+ 8	+ 5
10	5	7	9	8	7	10	9
+ 7	+ 8	+ 7	+ 9	+ 6	+ 9	+ 4	+ 5

B-22 Ask the student to write a worded problem which is described by 8 - 5 = ________, etc.

Example: John had eight pieces of gum but gave five to his friends. How many did he have left?

B-23 Write the sums.

1. 5 + (4 + 3) = ________
2. (5 + 4) + 3 = ________
3. (8 + 7) + 5 = ________
4. 9 + (7 + 4) = ________
5. 2 + (6 + 7) = ________

B-24 Write the mathematical symbols for:

1. plus ______
2. minus ______
3. is equal to ______

B-25 Place two sets of objects (total $\leq$ 25) in front of the child. Child writes the number property of set A and of set B, then writes the number property of the join of these sets, set C. See A-5 and B-26.

B-26 Child can write n(A) + n(B) = n(C)

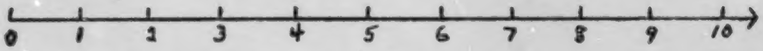
(e.g.: 5 + 3 = 8)

B-27 Given the following (or similar) addition sentences, the student can illustrate the sum by joining sets of objects.

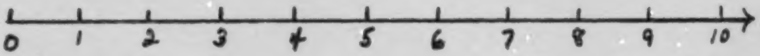
1. 5 + 4 = ________
2. 7 + 3 = ________
3. 8 + 5 = ________
4. 9 + 8 = ________
5. 14 + 6 = ________
6. 12 + 13 = ________

B-28 Illustrate on the number line the solution to each problem.

1. 3 + 4 = ________



2. 5 + 4 = ________



B-29 Write the sum of each of the following.

1. 12 + 23	2. 45 + 34	3. 83 + 15	4. 78 + 20	5. 60 + 39

B-30 Place a set (C) of counters $\leq$ 25 in front of the child. Child writes the number of this set. Teacher (or child) then separates the set into two disjoint subsets, A and B. Child writes the number of each subset.

B-31 Child writes n(C) - n(A) = n(B) or n(C) = n(A) + n(B).

(e.g.: 22 - 12 = 10 or 22 = 12 + 10.)

B-32 Write the sums of each of the following.

1 + 2 = ________

2 + 3 = ________

4 + 5 = ________

5 + 6 = ________

6 + 7 = ________

7 + 8 = ________

8 + 9 = ________

9 + 10 = ________

0 + 5 = ________

7 + 5 = ________

3 + 3 = ________

2 + 7 = ________

1 + 9 = ________

4 + 7 = ________

10 + 5 = ________

2 + 10 = ________

10 + 1 = ________

10 + 3 = ________

2 + 4 = ________

5 + 3 = ________

6 + 2 = ________

7 + 3 = ________

4 + 4 = ________

5 + 7 = ________

2 + 8 = ________

3 + 4 = ________

2 + 9 = ________

5 + 5 = ________

6 + 4 = ________

10 + 0 = ________

8 + 8 = ________

3 + 9 = ________

6 + 6 = ________

10 + 10 = ________

$$\begin{array}{r}2\\+\ 2\\\hline\end{array}\quad\begin{array}{r}6\\+\ 3\\\hline\end{array}\quad\begin{array}{r}8\\+\ 4\\\hline\end{array}\quad\begin{array}{r}10\\+\ 6\\\hline\end{array}\quad\begin{array}{r}4\\+\ 9\\\hline\end{array}\quad\begin{array}{r}9\\+\ 6\\\hline\end{array}\quad\begin{array}{r}3\\+\ 8\\\hline\end{array}\quad\begin{array}{r}2\\+\ 5\\\hline\end{array}$$

$$\begin{array}{r}10\\+\ 7\\\hline\end{array}\quad\begin{array}{r}5\\+\ 8\\\hline\end{array}\quad\begin{array}{r}7\\+\ 7\\\hline\end{array}\quad\begin{array}{r}9\\+\ 9\\\hline\end{array}\quad\begin{array}{r}8\\+\ 6\\\hline\end{array}\quad\begin{array}{r}7\\+\ 9\\\hline\end{array}\quad\begin{array}{r}10\\+\ 4\\\hline\end{array}\quad\begin{array}{r}9\\+\ 5\\\hline\end{array}$$

B-33 Write the differences of each of the following.

3 - 1 = ________ 9 - 2 = ________

2 - 2 = ________ 8 - 8 = ________

4 - 3 = ________ 10 - 7 = ________

5 - 2 = ________ 9 - 5 = ________

6 - 4 = ________ 7 - 4 = ________

8 - 6 = ________ 10 - 3 = ________

8 - 3 = ________ 10 - 9 = ________

10 - 4 = ________ 10 - 1 = ________

3 - 2	5 - 3	7 - 5	9 - 3	10 - 5	9 - 8	8 - 2	6 - 3
4 - 2	7 - 3	6 - 5	8 - 7	8 - 4	10 - 8	9 - 6	10 - 2
6 - 2	7 - 6	8 - 5	9 - 7	9 - 4	5 - 4	10 - 6	7 - 2

B-34 Write the missing number in each of the following:

1 + ______ = 3
______ + 3 = 5
4 + ______ = 9
______ + 6 = 11
6 + ______ = 13
______ + 8 = 15
8 + ______ = 17
______ + 10 = 19
5 + ______ = 5
______ + 5 = 12
3 + ______ = 6
______ + 7 = 9
1 + ______ = 10
______ + 7 = 11
10 + ______ = 15
______ + 2 = 12
10 + ______ = 11
______ + 2 = 4
6 + ______ = 9
______ + 4 = 12
6 + ______ = 16
______ + 9 = 13
9 + ______ = 15
______ + 8 = 11
2 + ______ = 7

10 + ______ = 13
______ + 4 = 6
5 + ______ = 8
______ + 2 = 8
7 + ______ = 10
______ + 4 = 8
5 + ______ = 12
______ + 8 = 10
3 + ______ = 7
______ + 9 = 11
5 + ______ = 10
______ + 4 = 10
0 + ______ = 10
______ + 8 = 16
3 + ______ = 12
______ + 6 = 12
10 + ______ = 20
______ + 7 = 17
5 + ______ = 13
______ + 7 = 14
9 + ______ = 18
______ + 6 = 14
7 + ______ = 16
______ + 4 = 14
9 + ______ = 14

B-35 Complete each of the following. Use counters if you need them.

11 - 1 = ____ 19 - ____ = 10 16 - 8 = ____ ____ - 15 = 10

13 - 4 = ____ 22 - ____ = 12 24 - 12 = ____ ____ - 13 = 11

12 - 7 = ____ 17 - ____ = 5 17 - 8 = ____ ____ - 7 = 12

(Teacher: There exists 285 different combinations of subtraction problems, positive difference, using minuends 11 - 25.)

B-36 Place "+" or "-" in the boxes to form a true statement.

13 ☐ 5 = 8 19 ☐ 7 < 15

10 ☐ 0 = 10 11 ☐ 18 > 27

18 ☐ 10 = 8 22 ☐ 11 < 12

13 ☐ 7 = 20 25 ☐ 0 > 20

15 ☐ 8 = 23 20 ☐ 9 < 13

B-37 Place <, =, or > in the boxes to form a true statement.

19 ☐ 7 + 12 15 + 4 ☐ 6 + 12

13 ☐ 23 - 10 7 + 12 ☐ 24 - 5

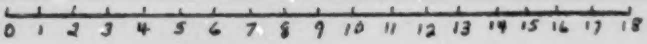
21 ☐ 11 + 11 18 - 5 ☐ 6 + 9

12 + 13 ☐ 26 14 + 7 ☐ 6 + 6 + 6

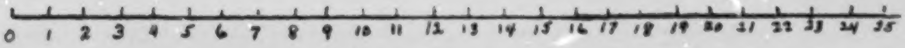
25 - 8 ☐ 17 4 + 4 + 4 ☐ 7 + 8 - 3

B-38 Illustrate on the number line the solution to each problem.

17 - 8 = ____


0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

22 - 13 = ____


0
1
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11
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14
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16
17
18
19
20
21
22
23
24
25

B-39 Write the difference of each of the following:

$$\begin{array}{rrrrrrrr} 21 & 32 & 45 & 58 & 67 & 76 & 84 & 99 \\ \underline{-\ 1} & \underline{-\ 2} & \underline{-\ 3} & \underline{-\ 5} & \underline{-\ 4} & \underline{-\ 5} & \underline{-\ 1} & \underline{-\ 6} \end{array}$$

79 - 7 = _____ 88 - 8 = _____

B-40 Write the difference of each of the following.

$$\begin{array}{rrrrrrrr} 28 & 35 & 46 & 57 & 69 & 78 & 83 & 99 \\ \underline{-13} & \underline{-21} & \underline{-24} & \underline{-33} & \underline{-14} & \underline{-45} & \underline{-41} & \underline{-74} \end{array}$$

B-41 (Teacher reads the problem to the children as they read it silently.)

1. José collected 25 bottle-caps and Kirk collected 23. Together how many did they have?

2. Louise invited 20 friends to her party. Three could not come. How many did come to the party?

3. Bonnie has 73 stamps in her collection. Bryan has 46 stamps. If they place these together, how many stamps are there?

4. The Ford garage ordered 25 new cars. They received 18. How many did not arrive?

C-42 Instruct the student to use any numerals he wishes and + or - to complete the sentences below.

Example: 3 + 2 = 5 7 - 2 = 5

1. _____ _____ = 100
_____ _____ = 100
_____ _____ = 100

2. _____ _____ = 50
_____ _____ = 50
_____ _____ = 50

3. _____ _____ = 42
_____ _____ = 42
_____ _____ = 42

4. _____ _____ = 57
_____ _____ = 57
_____ _____ = 57

5. _____ _____ = 23
_____ _____ = 23
_____ _____ = 23

C-43 Instruct the student to complete the sentence,

1、 14 + 9 = 23, 23 - 14 = ______ and 23 - 9 = ______

2. 18 + 6 = ______ 24 - 18 = ______ and 24 - 6 = 18

3. 492 + 165 = 657, 657 - 492 = ______ and 657 - 165 = ______

C-44 Instruct the students to complete the sentences.

1. ______ + 8 = 5 + 6

2. ______ + 8 > 5 + 6

3. ______ + 8 < 5 + 6

4. 7 - ______ = 5

5. 7 - ______ > 5

6. 7 - ______ < 5

7. 4 + 9 = ______ + 5

8. 4 + 9 > ______ + 5

9. 14 - 3 < ______ + 6

10. 14 - 6 > ______ + 3

C-45 Add the following:

1. $\begin{array}{r} 4 \\ 3 \\ +\ 9 \\ \hline \end{array}$ 2. $\begin{array}{r} 7 \\ 6 \\ +\ 5 \\ \hline \end{array}$ 3. $\begin{array}{r} 9 \\ 7 \\ +\ 5 \\ \hline \end{array}$ 4. $\begin{array}{r} 8 \\ 6 \\ +\ 4 \\ \hline \end{array}$ 5. $\begin{array}{r} 3 \\ 2 \\ +\ 1 \\ \hline \end{array}$

6. 3 + 1 + 0 =

7. 7 + 4 + 8 =

8. 1 + 9 + 9 =

9. 4 + 9 + 7 =

C-46 Add the following:

1. 7 + 25 = ______

2. 9 + 70 = ______

3. $\begin{array}{r} 87 \\ +\ 6 \\ \hline \end{array}$ 4. $\begin{array}{r} 39 \\ +\ 8 \\ \hline \end{array}$ 5. $\begin{array}{r} 99 \\ +\ 9 \\ \hline \end{array}$

C-47 Subtract, and complete the checking step.

1. 46 - 5 = ______

2. 90 - 7 = ______

3. $\begin{array}{r} 37 \\ -\ 9 \\ \hline \end{array}$ 4. $\begin{array}{r} 44 \\ -\ 4 \\ \hline \end{array}$ 5. $\begin{array}{r} 62 \\ -\ 8 \\ \hline \end{array}$

Check: 37 = 9 + ______ 44 = 4 + ______ 62 = 8 + ______

C-48 Add the following;

1. 25 + 37	2. 49 + 36	3. 72 + 18	4. 67 + 25	5. 79 + 12

C-49 Add the following:

1. 17 24 + 35	2. 22 25 + 29	3. 37 19 + 37	4. 14 23 + 59	5. 29 19 + 49

C-50 Add the following:

1. 79 + 17	2. 66 + 72	3. 89 + 72	4. 99 + 84	5. 45 + 55

C-51 Add the following:

1. 21 19 + 38	2. 72 61 + 93	3. 54 66 + 29	4. 96 47 + 78	5. 99 88 + 77

C-52 Subtract the following:

1. 21 - 19	2. 67 - 28	3. 76 - 75	4. 89 - 45	5. 91 - 57

C-53 Subtract and check where indicated.

1. 40 - 13	2. 82 - 69	3. 80 - 10	4. 72 - 69	5. 43 - 27

40 = 13 + ________

43 = 27 + ________

C-54 Add the following:

1. 119 + 122	2. 237 + 429	3. 529 + 131	4. 687 + 106	5. 436 + 257

C-55 Add the following:

1. 423 + 267	2. 493 + 307	3. 493 + 507	4. 976 + 345	5. 822 + 789

C-56 Add the following:

1. 237	2. 481	3. 721	4. 865	5. 789
246	292	832	998	686
+ 109	+ 153	+ 603	+ 537	+ 997

C-57 Add the following:

1. 9,287	2. 2,387	3. 8,859
+ 6,859	+ 7,613	+ 4,286

C-58 Subtract the following:

1. 347	2. 481	3. 865
- 219	- 232	- 256

C-59 Subtract the following:

1. 347	2. 481	3. 865
- 241	- 190	- 182

C-60 Subtract the following:

1. 937	2. 496	3. 437	4. 538	5. 925
- 483	- 305	- 148	- 379	- 528

C-61 Subtract the following:

1. 390	2. 780	3. 920
- 276	- 391	- 488

C-62 Subtract the following:

1. 307	2. 503	3. 705
- 216	- 299	- 326

C-63 Subtract the following:

1. 400	2. 200	3. 900
- 328	- 164	- 899

C-64 Subtract the following: Check

1. 4000	2. 5065	3. 7305
- 2342	- 2397	- 2877

C-65 Draw lines from the words to the numerals the words describe.

$$\begin{array}{r} 15 \\ +\ 34 \\ \hline 49 \end{array}$$

SUM

ADDEND

$$\begin{array}{r} 42 \\ -\ 31 \\ \hline 11 \end{array}$$

18 + 21 = 39

ADDEND

SUM

58 - 24 = 32

C-66 Place <, =, or > in the boxes to form a true statement.

98 + 87 ☐ 87 + 98

26 + 38 ☐ 32 + 32

71 + 28 ☐ 65 + 39

44 - 18 ☐ 80 - 44

17 + 9 + 10 ☐ 95 - 59

C-67 Write the missing numbers in each of the following.

_______ + 18 = 18 + 9

41 + _______ = 33 + 41

56 + 75 = _______ + 56

_______ + 8 = 8 + _______

C-68 Write the missing numbers in each of the following.

(6 + _______) + 7 = 6 + (8 + 7)

15 + (9 + _______) = (15 + 9) + 12

96 + (_______ + 78) = (96 + _______) + 78

C-69 Place = or ≠ in the boxes to form a true statement.

16 + 8 ☐ 8 + 16

0 - 9 ☐ 9 - 0

16 - 8 ☐ 8 - 16

C-70 Write the missing number in each of the following.

847 = 0 = ________

555 - 0 = ________

0 + 432 = ________

C-72 Without working the problem circle the nearest estimate.

1. 87 + 26, to the nearest ten.

   a) 110 b) 120 c) 130

2. 96 - 54, to the nearest ten.

   a) 30 b) 40 c) 50

3. 929 - 364, to the nearest hundred

   a) 500 b) 400 c) 300

4. 9152 + 3678, to the nearest hundred.

   a) 9000 + 200 + 3000 + 700

   b) 9000 + 100 + 3000 + 700

   c) 9000 + 100 + 3000 + 600

C-73 Write the number sentence and the solution for each of the following: (Do #1 or #3, and #2 and #4.)

1. There are 18 boy's bicycles and 16 girl's bicycles parked at the school. How many bicycles are there in all.
2. Sally's club purchased 525 boxes of cookies to sell. They sold 498 boxes. How many boxes were not sold?
3. Firestone made 357 white-wall tires and 476 black-wall tires for shipment to a retail store. How many tires are in the shipment?
4. United received 892 telephone reservations for flights out of Des Moines last week. Only 776 of these reservations were picked up. How many people did not show up for their reservations?

C-74 Write the number sequence and the solution for each of the following: (Do #1 and #2 or #3 and #4.)

1. A train went 48 miles the first hour of a trip and 67 miles the second hour. How far did it go in two hours?

2. Whittier school has 360 students. Unit A has 110 students and Unit B 93 students. Unit C has all the other students. How many does Unit C have?

3. Whittier school ordered 67 small chairs, 85 large chairs, and 134 tablet arm chairs. How many chairs in all were ordered?

4. Mary and John have 200 papers to deliver. Mary had delivered 78 and John had delivered 69 when they met later. How many more papers do they have to deliver?

C-75 Write the missing number in each of the following:

20 + 6 = ________
15 + 10 = ________
14 + 6 = ________
8 + 8 = ________
11 + 11 = ________
13 + 6 = ________
10 + 9 = ________
7 + 7 = ________
14 + 11 = ________
12 + 7 = ________
8 + 11 = ________
10 + 13 = ________
7 + 15 = ________
18 + 6 = ________
11 + 12 = ________
20 + 9 = ________
15 + 9 = ________

9 + 11 = ________
16 + 9 = ________
14 + 7 = ________
15 + 12 = ________
13 + 11 = ________
8 + 16 = ________
12 + 12 = ________
6 + 17 = ________
9 + 9 = ________
7 + 6 = ________
11 + 7 = ________
12 + 9 = ________
15 + 8 = ________
17 + 10 = ________
20 + 20 = ________
6 + 16 = ________
11 + 6 = ________

8 + 12 = ________
10 + 11 = ________
15 + 6 = ________
14 + 12 = ________
8 + 13 = ________
12 + 6 = ________
7 + 20 = ________
7 + 13 = ________
19 + 6 = ________
15 + 11 = ________
13 + 9 = ________
14 + 8 = ________
16 + 7 = ________
15 + 13 = ________
9 + 14 = ________
12 + 13 = ________
8 + 7 = ________

C-75 (Cont.)

17 + 7	9 + 7	6 + 8	17 + 9	16 +12	18 +14	13 +13
14 +14	16 +11	19 + 7	18 +12	15 +15	18 + 8	20 +12
17 +14	16 +13	18 + 7	17 + 8	17 +11	18 + 9	16 +14
19 +13	15 +14	17 +12	16 +15	14 +13	19 +11	17 +13
18 +15	12 +19	18 +13	15 +20	14 +19	17 +15	19 +15
9 +19	19 +16	18 +18	17 +18	19 +17	18 +16	17 +17
17 +16	19 +19	18 +11	16 +16	19 + 8	20 +20	19 +18

C-76 Write the missing number in each of the following.

20 - 6 = ________
15 - 10 = ________
14 - 6 = ________
8 - 8 = ________
11 - 11 = ________

13 - 6 = ________
10 - 9 = ________
15 - 3 = ________
14 - 11 = ________
12 - 7 = ________

11 - 8 = ________
13 - 10 = ________
15 - 7 = ________
18 - 6 = ________
12 - 11 = ________

20 - 9 = ________
15 - 9 = ________
11 - 9 = ________
16 - 9 = ________
14 - 7 = ________

15 - 12 = ________
13 - 11 = ________
16 - 8 = ________
17 - 4 = ________
17 - 6 = ________

20 - 3 = ________
7 - 6 = ________
11 - 7 = ________
12 - 9 = ________
15 - 8 = ________

17 - 10 = ________
18 - 5 = ________
16 - 6 = ________
11 - 6 = ________
12 - 8 = ________

11 - 10 = ________
15 - 6 = ________
14 - 12 = ________
13 - 8 = ________
12 - 6 = ________

20 - 7 = ________
13 - 7 = ________
19 - 6 = ________
15 - 11 = ________
13 - 9 = ________

14 - 8 = ________
16 - 7 = ________
15 - 13 = ________
14 - 9 = ________
13 - 4 = ________

8 - 7 = ________

C-76 (Cont.)

17 - 7	9 - 7	8 - 6	17 - 9	16 -12	18 -14	15 - 6
13 - 5	16 -11	19 - 7	18 -12	12 - 3	18 - 8	20 -12
17 -14	16 -13	18 - 7	17 - 8	17 -11	18 - 9	16 -14
19 -13	15 -14	17 -12	16 -15	12 - 4	19 -11	17 -13
18 -15	19 -12	18 -13	20 -15	19 -14	17 -15	19 -15
19 - 9	19 -16	20 - 3	11 - 4	19 -17	18 -16	11 - 5
17 - 4	12 - 5	18 -11	14 - 5	19 - 8	11 - 3	14 - 4

C-77 Write the missing number in each of the following.

100 + _______ = 200

15 + _______ = 80

45 + _______ = 60

_______ + 30 = 90

_______ + 75 = 100

_______ + 93 = 100

_______ + 87 = 100

_______ + 50 = 200

25 + _______ = 175

20 + _______ = 150

C-78 Write the missing number in each of the following.

150 - _______ = 100

98 - _______ = 70

200 - _______ = 125

125 - _______ = 50

163 - _______ = 38

C-79 Draw lines from the words to the numerals they describe.

$$\begin{array}{r}77\\-18\\\hline 59\end{array}$$

- difference -
- minuend -
- subtrahend -

120 - 30 = 90

D-80 Without working the problem circle the nearest estimate.

1. 3469 + 7082, to the nearest hundred.

   a) 10,600 b) 10,500 c) 10,700

2. 8531 - 5252, to the nearest hundred.

   a) 3300 b) 3400 c) 3200

3. 8765 + 3490, to the nearest thousand.

   a) 8000 + 3000 c) 9000 + 3000

   b) 8000 + 4000 d) 9000 + 4000

4. 9470 - 4567, to the nearest thousand.

   a) 9000 - 4000 c) 10,000 - 4000

   b) 9000 - 5000 d) 10,000 - 5000

D-81 Write the second member of each ordered pair so that it satisfies the rule.

Example: 3 + n (1, 4), (2, 5), ...

1. n + 5 $\longrightarrow$ (1, ____), (3, ____)
2. 7 - n $\longrightarrow$ (2, ____), (5, ____)
3. 12 + n $\longrightarrow$ (6, ____), (9, ____)

D-82 Write the rule that describes the pairs of numbers.

1. (1, 3), (2, 4), (3, 5). ______________________________

2. (1, 7), (2, 6), (4, 4). ______________________________

D-83 Write the number sentence for and solve each of the following:

1. Trudy typed two pages in 20 minutes. There were 331 words on the first page and 325 on the second page. How many words did she type?

2. From a box holding 115 marbles, Mary chose 45 and John chose 47. How many marbles remain in the box?

3. Elmwood school had 325 reams of paper. The principal's office used 226 reams. How many reams remain?

4. Ace Auto sold 294 new trucks and 489 new passenger cars last year, but still had 52 unsold new cars on the lot. How many cars did they receive from the factory?

D-84 1. Will 787 + 423 have the same answer as 700 + 80 + 7 + 400 ± 20 + 3?

Circle your response: Yes, No.

2. Will 48 - 25 have the same answer as 40 + 8 - 20 - 5?

Circle your response: Yes, No.

3. Use expanded notation to add the following:

$$\begin{array}{r} 129 \\ 376 \\ +\ 205 \\ \hline \end{array}$$

____

D-85 Write the sum of each of the following.

$$\begin{array}{r} 9087 \\ +\ 4762 \\ \hline \end{array} \qquad \begin{array}{r} 8765 \\ 3044 \\ +\ 4028 \\ \hline \end{array} \qquad \begin{array}{r} 1234 \\ 5678 \\ 9012 \\ 3456 \\ +\ 7890 \\ \hline \end{array}$$

D-87 Write the missing numbers.

1. 27, 31, 35, _______, _______.

2. 18, 23, 28, _______, _______.

3. 20, 31, 42, _______, _______.

D-88 Write the missing numbers.

1. 20, 18, 16, _______, _______.

2. 33, 28, 23, _______, _______.

3. 9, 6, 3, _______, _______.

E-89 Write the sum of the following.

```
  987654
  123456
   54321
  708090
  361072
+ 121212
--------
```

E-90 Write the differences of the following.

```
  907080          470003
- 123456        -  56789
--------        --------
```

E-91 Write the number sentence for and solve each of the following.

1. The population of Denver is approximately 1,000,000. About 333,000 of these are below twenty years of age and 220,500 are over fifty years of age. How many are twenty to fifty years old?

2. Three shipments of pencils to a wholesale distributor each contained 125,000 pencils. A fourth shipment of 58,400 pencils arrived. They had ordered 500,000 pencils. How many have not yet arrived?

E-92 Complete the following statements.

1. 196 + 29 = _______ + 196

2. 897 + _______ = 453 + 897

E-93 Complete the following statements.

1. (89 + 271) + 18 = _______ + (271 + 18)

2. (56 + _______) + 478 = 56 + (19 + 478)

F-94 Which of the following do(es) not have a whole number "answer".

1. 55 - 18 = ___?___

3. 0 - 3 = ___?___

2. 16 - 20 = ___?___

4. 1,287 - 287 = ___?___

WHOLE NUMBERS:
MULTIPLICATION-DIVISION STRAND

1979 Mathematics (K-8) Performance Objectives

Test Items

Whole Numbers: Multiplication-Division Strand

A-1 Place a rectangular array of $\leq$ 12 counters on child's desk. Ask, "How many rows? How many columns? How many counters?" Use the phrase, "A __(3)__ by __(4)__ arrangement (array) has __?__ counters." Teacher writes the number sentence (3 x 4 = 12, etc.) on the chalkboard.
Ask child to form a ______ by ______ rectangular array (______ rows and ______ columns), then name the number property of the array. Teacher writes the number sentence on chalkboard.

A-2 Place $\leq$ 12 counters on a sheet of paper on the child's desk. Ask child to arrange counters (in rectangular array) in rows and columns to resemble a model the teacher formed. Ask child "How many counters are in the set?" Turn paper 90° (also 45°). Ask again, "How many counters are in the set?"
Checking Conservation of Number and the Commutative Property for Multiplication.

A-3 Place ______ (equivalent) sets of ______ each, total $\leq$ 12, on child's desk. Ask child to name the number of sets, the number of counters in each, and the total number of counters. Reshape the counters into a rectangular array. Teacher: "Name the number of rows and columns and the total number of counters." Teacher writes number sentence on chalkboard.

A-4 Place $\leq$ 12 counters on child's desk. Teacher: "Form ______ sets of ______ each." These do not need to be in a rectangular array, but occasionally the teacher should suggest reforming them into such an array. Teacher writes number sentence on chalkboard.

A-5 Place $\leq$ 18 counters on child's desk. Ask several questions, as follows: "How many sets of ______ each are equivalent to a set of ______?" Occasionally help reform their arrangements into rectangular arrays. Teacher writes number sentence on chalkboard.

A-6 Place $\leq$ 18 counters on child's desk. Ask: "______ sets of ______ each is (equals) how many?" Teacher writes number sentence on chalkboard. Reform the counters in a rectangular array and ask: "A ______ by ______ set is how many?" Teacher refers to number sentence on chalkboard.

A-7 Create a set of cards with the following items each on a separate card. Shuffle the cards, then have the child form three columns with equivalent "expressions" in each row.

1 x 1	1	●	3 x 2	● ● ● ● ● ●	6
1 x 2	2	● ●	3 x 3	● ● ● ● ● ● ● ● ●	9
1 x 3	3	● ● ●	3 x 4	● ● ● ● ● ● ● ● ● ● ● ●	12
1 x 4	4	● ● ● ●	5 x 2	● ● ● ● ● ● ● ● ● ●	10
1 x 5	5	● ● ● ● ●	4 x 3	● ● ● ● ● ● ● ● ● ● ● ●	12
2 x 1	2	● ●	4 x 2	● ● ● ● ● ● ● ●	8
3 x 1	3	● ● ●	0 x 5		0
2 x 2	4	● ● ● ●			
2 x 3	6	● ● ● ● ● ●			
2 x 4	8	● ● ● ● ● ● ● ●			
2 x 5	10	● ● ● ● ● ● ● ● ● ●			

A-8 (Place 18 counters on child's desk to use in the following, if necessary.)

Write = or ≠ in the boxes to make true statements.

1. 2 x 2 ☐ 4
2. 2 x 2 ☐ 2 + 2
3. 2 x 3 ☐ 6
4. 2 x 3 ☐ 3 + 3
5. 3 x 2 ☐ 2 + 2 + 2
6. 4 x 3 ☐ 4 + 3
7. 3 x 4 ☐ 4 + 4 + 4 + 4
8. 1 x 5 ☐ 5
9. 5 x 1 ☐ 1 + 1 + 1 + 1
10. 0 x 5 ☐ 0

A-9 Create a set of cards with the following items each on a separate card. Shuffle the cards, then have the child form three columns with equivalent expressions in each row.

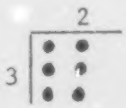
0 x 2	0	0	0 x 3	0	0
1 x 2	2	2	1 x 3	3	3
2 x 2	2 + 2	4	3 x 3	3 + 3 + 3	9
3 x 2	2 + 2 + 2	6	4 x 3	3 + 3 + 3 + 3	12
4 x 2	2 + 2 + 2 + 2	8	5 x 3	3 + 3 + 3 + 3 + 3	15
5 x 2	2 + 2 + 2 + 2 + 2	10	3 x 4	4 + 4 + 4	12
2 x 3	3 + 3	6	4 x 4	4 + 4 + 4 + 4	16
2 x 4	4 + 4	8	3 x 5	5 + 5 + 5	15
2 x 5	5 + 5	10	1 x 5	5	5
1 x 4	4	4	0 x 4	0	0

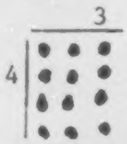
A-10 Place a set of ≤ 18 counters on child's desk. Say, "Separate the (12) counters into sets (or groups) with (3) in each set. "How many are there?" Teacher writes, "(12) divided by (3) = (4)," on chalkboard. Replaces "divided by" with " ÷ " at appropriate time "to save time." Review (3) x (4) = (12).

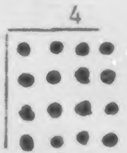
A-11 (The inverse of A-10) Place a set of ≤ 18 counters on child's desk. Say, "Separate the (11) ÷ (3) = (3), Remainder (2).

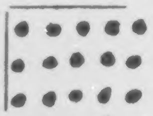
A-12 (Another form of A-11) Place a set of ≤ 18 counters on child's desk. Say, "How many sets of (4) each can you separate from the set of (9) ? Are there extra counters?" Teacher writes: ______ ÷ (4) = (2), Remainder (1).

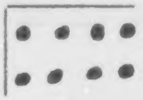
B-12a









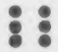


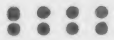
3 x 2 = ____ 4 x 3 = ____ ____ x 4 = ____ ____ x ____ = 15 ____ x ____ = ____

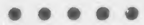
B-13 Complete the following table for multiplication. Use counters if you wish.

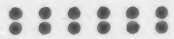
X	0	1	2	3	4	5	6	7	8	9
0	0									0
1										
2			2					14		
3				9				☒	☒	☒
4						☒	☒	☒	☒	☒
5					☒	☒	☒	☒	☒	☒
6					☒	☒	☒	☒	☒	☒
7				☒	☒	☒	☒	☒	☒	☒
8				☒	☒	☒	☒	☒	☒	☒
9			18	☒	☒	☒	☒	☒	☒	☒

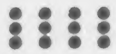
B-14 Write the missing numbers in the blanks.

1.  3 x _______ = 6

2.  _______ x 4 = 8

3.  _______ x 5 = 5

4.  2 x _______ = 12

5.  3 x _______ = _______

6. 0 x 6 = _______

B-15 Write the missing numbers in the blanks.

1. 2 x _______ = 4
2. 1 x _______ = 3
3. _______ x 3 = 12
4. 6 x _______ = 12
5. _______ x 3 = 18
6. _______ x 2 = 10
7. 4 x _______ = 0
8. 5 x _______ = 5

B-16 Write ≠ or = in the box to make a true statement.

1. 5 x 2 ☐ 10
2. 3 x 7 ☐ 14
3. 4 x 2 ☐ 9
4. 6 x 3 ☐ 18
5. 7 x 2 ☐ 14
6. 1 x 2 ☐ 2
7. 1 x 0 ☐ 1
8. 4 x 4 ☐ 8
9. 9 x 1 ☐ 9
10. 0 x 8 ☐ 0

B17 through B-22

Prepare flash cards for these products and the oral responses.
Prepare work sheets for the written responses.

B-23 Write the answers in the blanks.

1. How many groups of 2 are in a group of 6? __________
2. How many groups of 3 are in a group of 12? __________
3. How many groups of 4 are in a group of 16? ________
4. How many groups of 2 are in a group of 10? ________
5. How many groups of 6 are in a group of 18? ________
6. How many groups of 1 are in a group of 7? ________
7. How many groups of 2 are in a group of 12? ________
8. How many groups of 5 are in a group of 0? ________
9. How many groups of 5 can you subtract from 15? ________
10. How many groups of 6 must you add to get 18? ________

B-24 (Either have students use counters or have a set of cards with rectangular arrays pictured on them.)

Form a rectangular array to demonstrate:

1. 2 x 6
2. 4 x 3
3. 3 x 4
4. 1 x 7
5. 9 x 2
6. 6 x 3

B-25 Write the missing number in ech of the blanks.

1. 2 x 2 = ________
2. 3 x 3 = ________
3. 4 x 2 = ________
4. 2 x 5 = ________
5. 6 x 2 = ________
6. 2 x 6 = ________
7. 1 x 3 = ________
8. 5 x 1 = ________
9. 3 x 4 = ________
10. 3 x 2 = ________
11. 4 x 5 = ________
12. 6 x 4 = ________
13. 4 x 4 = ________
14. 3 x 5 = ________
15. 5 x 6 = ________
16. 4 x 3 = ________
17. 6 x 0 = ________
18. 5 x 5 = ________
19. 3 x 6 = ________
20. 6 x 6 = ________

B-26 Write the number sentence and the solution for each problem.

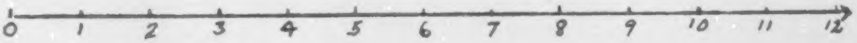
1. Pat bought 3 packages with 6 pencils in each package. How many pencils did she buy?

2. Jerry purchased five new tires for each of three antique cars he remodeled. How many tires did he buy?

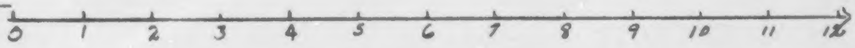
C-27 Demonstrate the multiplication problems on the number line.

Example:

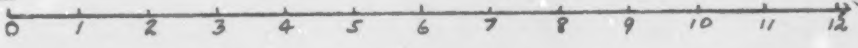
2 x 3 = 6



1. 3 x 3 = ________

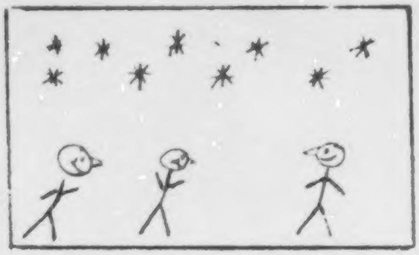


2. 4 x 2 = ________

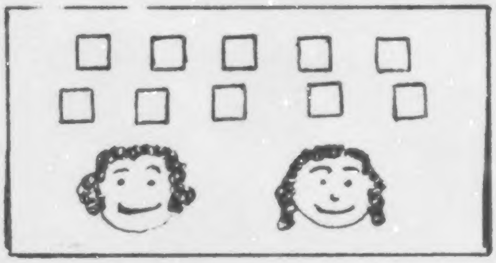


C-28 1. (Place a set of $\leq$ 18 counters on child's desk.) Say, "Use the counters to show ______ ÷ ______." Also write this on paper/chalkboard.

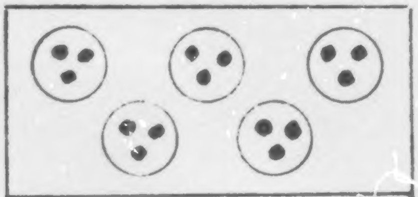
2. Draw lines from the *'s to the "stick" figures so that each has the same number.



3. Each person gets the same number of ☐'s. How many does each get? ______



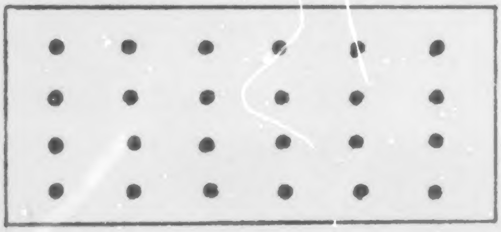
4. Circle the correct name for the set of dots.



15 ÷ 5   12 ÷ 3

3 + 5

5. Draw closed curves around the dots to show 24 ÷ 6.



C-29 through C-32

Prepare flash cards for each of these products and the oral responses.
Prepare work sheets for the written responses.

C-33 Write the missing numbers in the blanks. (Note the sum of the digits of the product when 9 is a factor.)

1. 2 x 5 = ________
2. 1 x 8 = ________
3. 3 x 2 = ________
4. 7 x 3 = ________
5. 4 x 2 = ________
6. 3 x 5 = ________
7. 2 x 2 = ________
8. 0 x 9 = ________
9. 4 x 3 = ________
10. 2 x 6 = ________
11. 4 x 7 = ________
12. 3 x 3 = ________
13. 5 x 4 = ________
14. 6 x 6 = ________
15. 3 x 6 = ________
16. 7 x 2 = ________
17. 6 x 4 = ________
18. 2 x 8 = ________
19. 5 x 5 = ________
20. 4 x 4 = ________

21. 5 x0
22. 9 x2
23. 6 x5
24. 7 x7
25. 3 x8

26. 4 x9
27. 7 x5
28. 3 x9
29. 4 [illegible]8
30. 5 x9

31. 7 x6
32. 8 x5
33. 9 x1
34. 6 x9
35. 8 x7

36. 9 x8
37. 8 x8
38. 6 x8
39. 9 x9
40. 7 x9

C-34 List the first six multiples of each of the following.

1. 2, 4, ______, ______, ______, ______, ______.

2. 3, ______, ______, 12, ______, ______, ______.

3. 4, ______, ______, ______, ______, 24, ______.

4. 5, ______, ______, ______, ______, ______, ______.

5. 6, ______, ______, ______, ______, ______, ______.

6. 7, ______, ______, ______, ______, ______, ______.

7. 8, ______, ______, ______, ______, ______, ______.

8. 9, ______, ______, ______, ______, ______, ______.

9. 10, ______, ______, ______, ______, ______, ______.

10. 11, ______, ______, ______, ______, ______, ______.

11. 12, ______, ______, ______, ______, ______, ______.

C-35 Write the missing numbers in the blanks.

1. 8 ÷ 1 = ______

2. 8 = 1 x ______

3. 19 ÷ 1 = ______

4. 19 = 1 x ______

Explain your answers to your teacher.

C-36 Write the missing numbers in the blanks.

1. 2 ÷ 2 = ______

2. 4 ÷ 2 = ______

3. 6 ÷ 2 = ______

4. 8 ÷ 2 = ______

5. 10 ÷ 2 = ______

6. 12 ÷ 2 = ______

7. 14 ÷ 2 = ______

8. 16 ÷ 2 = ______

9. 18 ÷ 2 = ______

10. 20 ÷ 2 = ______

C-37 Write the missing numbers in the blanks.

1. 3 ÷ 3 = ______
2. 6 ÷ 3 = ______
3. 9 ÷ 3 = ______
4. 12 ÷ 3 = ______
5. 15 ÷ 3 = ______
6. 18 ÷ 3 = ______
7. 21 ÷ 3 = ______
8. 24 ÷ 3 = ______
9. 27 ÷ 3 = ______
10. 30 ÷ 3 = ______

C-38 Write the missing numbers in the blanks.

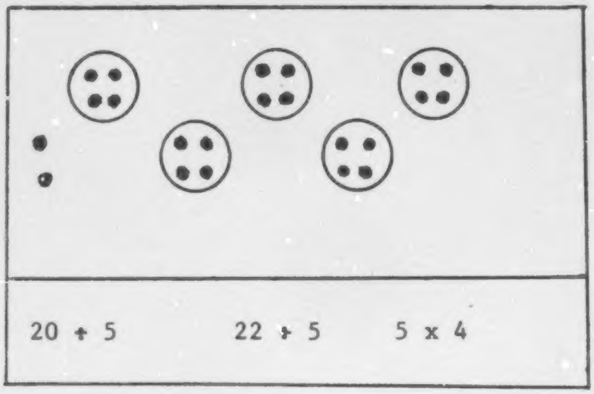
1. 4 ÷ 4 = ______
2. 8 ÷ 4 = ______
3. 12 ÷ 4 = ______
4. 16 ÷ 4 = ______
5. 20 ÷ 4 = ______
6. 24 ÷ 4 = ______
7. 28 ÷ 4 = ______
8. 32 ÷ 4 = ______
9. 36 ÷ 4 = ______
10. 40 ÷ 4 = ______

C-39 Write the missing numbers in the blanks.

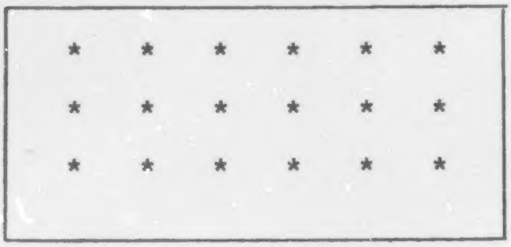
1. 5 ÷ 5 = ______
2. 10 ÷ 5 = ______
3. 15 ÷ 5 = ______
4. 20 ÷ 5 = ______
5. 25 ÷ 5 = ______
6. 30 ÷ 5 = ______
7. 35 ÷ 5 = ______
8. 40 ÷ 5 = ______
9. 45 ÷ 5 = ______
10. 50 ÷ 5 = ______

Write the answer in the space provided.

C-40 1. Circle the correct name for the sets of dots.



2. Draw closed curves around the stars to show 18 ÷ 5 = 3 R 3.



3. 50 ÷ 5 = ________

4. 45 ÷ 4 = ________

5. $7\overline{)\,18}$

6. $8\overline{)\,35}$

7. $6\overline{)\,40}$

8. $9\overline{)\,85}$

C-41 Teacher hears child count orally, or into a tape recorder, or has the child write the sequences on paper.

C-42 Write the missing numbers in the blanks.

1. 100 x 1 = _______
2. 100 x 3 = _______
3. 100 x 5 = _______
4. 9 x 100 = _______
5. 100 x 10 = _______

C-43 Write the missing numbers in the blanks.

1. 100 x 2 = _______
2. 200 x 3 = _______
3. 400 x 4 = _______
4. 600 x 5 = _______
5. 800 x 6 = _______

C-44

1. $\begin{array}{r} 10 \\ \text{x } 5 \\ \hline \end{array}$
2. $\begin{array}{r} 11 \\ \text{x } 6 \\ \hline \end{array}$
3. $\begin{array}{r} 21 \\ \text{x } 3 \\ \hline \end{array}$
4. $\begin{array}{r} 34 \\ \text{x } 2 \\ \hline \end{array}$
5. $\begin{array}{r} 82 \\ \text{x } 4 \\ \hline \end{array}$

C-45

1. 897 x 1 = ______
2. 221 x 4 = ___________
3. $\begin{array}{r} 322 \\ \text{x } 3 \\ \hline \end{array}$
4. $\begin{array}{r} 110 \\ \text{x } 9 \\ \hline \end{array}$
5. $\begin{array}{r} 301 \\ \text{x } 8 \\ \hline \end{array}$

C-46 Write the missing numbers in the blanks.

1. 10 x 5 = _______
2. 10 x 15 = _______
3. 20 x 5 = _______
4. 20 x 10 = _______
5. 20 x 20 = _______
6. 30 x 23 = _______
7. 40 x 10 = _______
8. 30 x 50 = _______
9. 80 x 11 = _______
10. 90 x 11 = _______

C-47 Write the missing numbers in the blanks.

1. 100 x 9 = ________
2. 100 x 10 = ________
3. 100 x 11 = ________
4. 100 x 12 = ________
5. 100 x 58 = ________
6. 1000 x 9 = ______
7. 1000 x 10 = ______
8. 1000 x 12 = _______
9. 1000 x 70 = ________
10. 1000 x 99 = ________

C-48 Write the missing numbers in the blanks.

1. 10 x 123 = ______
2. 10 x 406 = _______
3. 10 x 500 = _________
4. 100 x 765 = _______
5. 100 x 870 = ________
6. 100 x 600 = _______
7. 1000 x 456 = ________
8. 1000 x 797 = _________
9. 1000 x 450 = _________
10. 1000 x 3000= _________

C-49 Write the missing numbers in the blanks.

1. 2 x ______ = 10

2. ____ x 8 = 8

3. 3 x ____ = 6

4. ____ x 3 = 21

5. ____ x 4 = 8

6. 3 x ____ = 15

7. ____ x 2 = 4

8. ____ x 9 = 0

9. 4 x ____ = 12

10. 2 x ____ = 12

11. ____ x 7 = 28

12. ____ x 3 = 9

13. 5 x ____ = 20

14. 6 x ____ = 36

15. 3 x ____ = 18

16. ____ x 2 = 14

17. ____ x 4 = 24

18. 2 x ____ = 16

19. 5 x ____ = 25

20. ____ x 4 = 16

21. 5 x ______ = 0

22. 2 x ____ = 18

23. ____ x 5 = 30

24. 7 x ____ = 49

25. 3 x ____ = 24

26. ____ x 9 = 36

27. ____ x 5 = 35

28. 3 x ____ = 27

29. 4 x ____ = 32

30. 5 x ____ = 45

31. ____ x 6 = 42

32. ____ x 5 = 40

33. ____ x 1 = 9

34. 6 x ____ = 54

35. 8 x ____ = 56

36. ____ x 8 = 72

37. ____ x 8 = 64

38. 6 x ____ = 48

39. 9 x ______ = 81

40. ____ x 9 = 63

C-50 Draw lines from the words to the number they name

21 x 5 = 105

FACTOR

PRODUCT

$$\begin{array}{r} 12 \\ \underline{\times\ 3} \\ 36 \end{array}$$

C-51 Write the missing numbers in the blanks.

1. 3 + (2 x 5) = ________

2. (4 + 3) x 5 = ________

3. 2 x (10 - 4) = ________

4. (12 - 7) x 6 = ________

5. 4 + (6 - 2) = ________

6. 10 - (5 x 2) = ________

C-52 Use parentheses to make each of the following statements true.

1. 3 + 4 x 5 = 35
2. 3 x 4 + 5 = 17
3. 2 + 5 x 6 = 32
4. 2 x 3 + 6 = 18

C-53 Write the missing numbers in the blanks.

1. ____ + (3 x 2) = 7
2. 4 + (2 x ___) = 14
3. 7 - (____ x 5) = 2
4. (7 x 8) + ____ = 56
5. (2 x 3) + (____ x 4) = 14
6. (9 x ____) + 12 = 12

C-54 Write the missing numbers in the blanks.

1. 6 x ______ = 3 x 6
2. 7 x (_____ x 8) = (7 x 5) x 8
3. 18 x ________ = 18
4. ______ x 15 = 0
5. (_____ x 9) x 3 = 10 x (9 x 3)

C-55 Write = or ≠ in the box as to form true statements.

1. 4 x (1 + 5) ☐ (4 x 1) + 5
2. 2 x (3 + 4) ☐ (2 x 3) + (2 x 4)
3. 5 x (2 + 3) ☐ (5 x 2) + (5 x 3)

C-57 Write the answer in the space provided.

1. $\begin{array}{r} 43 \\ \underline{x\ 3} \end{array}$
2. $\begin{array}{r} 34 \\ \underline{x\ 4} \end{array}$
3. $\begin{array}{r} 47 \\ \underline{x\ 5} \end{array}$
4. $\begin{array}{r} 29 \\ \underline{x\ 7} \end{array}$
5. (70 + 5) x 4 = ________ x 4
6. 68 x 8 = (______ x 8) + (______ x 8) = ___________

C-58 Write the answer in the space provided.

1. $\begin{array}{r} 100 \\ \underline{x\ \ 9} \end{array}$
2. $\begin{array}{r} 201 \\ \underline{x\ \ 8} \end{array}$
3. $\begin{array}{r} 405 \\ \underline{x\ \ 5} \end{array}$
4. $\begin{array}{r} 606 \\ \underline{x\ \ 4} \end{array}$

C-59 Write the answer in the space provided.

1. 562 x 4

2. 471 x 5

3. 716 x 3

4. 180 x 9

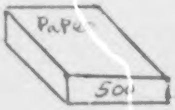
C-60 Write the answer in the space provided.

1. 171 x 8

2. 745 x 6

3. 936 x 9

C-61 Write the number sentence and the solution for each of the following.

1. 

Trudy has nine reams of paper. Each ream contains 500 sheets. How many sheets of paper is this?

2. Six loads of bricks were delivered. Each load contained 645 bricks. How many bricks were delivered?

C-62 Write the missing factors in the blanks without using 1 as a factor.

1. ________ x ________ = 12
2. ________ x ________ = 18
3. ________ x ________ = 24
4. ________ x ________ = 30
5. ________ x ________ = 28
6. ________ x ________ = 22
7. ________ x ________ = 20
8. ________ x ________ = 25
9. ________ x ________ = 15
10. ________ x ________ = 26

D-62 Name a pair of **factors** for each of the following numbers.

35 = ________ x ________
32 = ________ x ________
24 = ________ x ________
15 = ________ x ________
12 = ________ x ________
30 = ________ x ________
42 = ________ x ________

D-63 Write the missing numbers in the blanks.

1. 6 ÷ 6 = ______
2. 12 ÷ 6 = ______
3. 18 ÷ 6 = ______
4. 24 ÷ 6 = ______
5. 30 ÷ 6 = ______
6. 36 ÷ 6 = ______
7. 42 ÷ 6 = ______
8. 48 ÷ 6 = ______
9. 54 ÷ 6 = ______
10. 60 ÷ 6 = ______

D-64 Write the missing numbers in the blanks.

1. 7 ÷ 7 = ______
2. 14 ÷ 7 = ______
3. 21 ÷ 7 = ______
4. 28 ÷ 7 = ______
5. 35 ÷ 7 = ______
6. 42 ÷ 7 = ______
7. 49 ÷ 7 = ______
8. 56 ÷ 7 = ______
9. 63 ÷ 7 = ______
10. 70 ÷ 7 = ______

D-65 Write the missing numbers in the blanks.

1. 8 ÷ 8 = ______
2. 16 ÷ 8 = ______
3. 24 ÷ 8 = ______
4. 32 ÷ 8 = ______
5. 40 ÷ 8 = ______
6. 48 ÷ 8 = ______
7. 56 ÷ 8 = ______
8. 64 ÷ 8 = ______
9. 72 ÷ 8 = ______
10. 80 ÷ 8 = ______

D-66 Write the missing numbers in the blanks.

1. 9 ÷ 9 = ______
2. 18 ÷ 9 = ______
3. 27 ÷ 9 = ______
4. 36 ÷ 9 = ______
5. 45 ÷ 9 = ______
6. 54 ÷ 9 = ______
7. 63 ÷ 9 = ______
8. 72 ÷ 9 = ______
9. 81 ÷ 9 = ______
10. 90 ÷ 9 = ______

(Note the sum of the digits of the dividend.)

D-67 Write the missing numbers in the blanks.

1. If $10 \div 2 = 5$, then $2 \times 5 =$ __________

2. If $18 \div N = M$, then $N \times M =$ __________

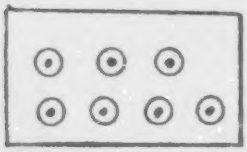
D-68 Write the missing numbers in the blanks.

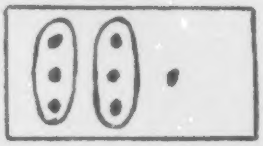
1. $8 \div 1 =$ __________
2. $4 \div 2 =$ __________
3. $2 \div 2 =$ __________
4. $6 \div 2 =$ __________
5. $8 \div 2 =$ __________
6. $6 \div 3 =$ __________
7. $0 \div 9 =$ __________
8. $6 \div 6 =$ __________
9. $8 \div 4 =$ __________
10. $10 \div 5 =$ __________
11. $9 \div 3 =$ __________
12. $10 \div 2 =$ __________

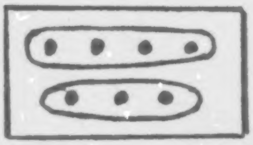
D-69 1. Use 15 counters to explain $15 \div 4 =$ ______ to your teacher.

2. Mark the picture that best pictures the division,

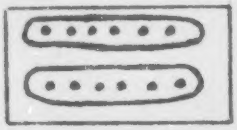
$7 \div 3 =$ __________

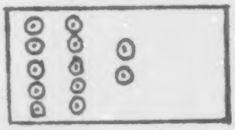


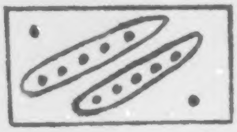




3. $12 \div 5 =$ __________







D-70 Complete the following division problems.

1. $2\overline{)46}$
2. $3\overline{)63}$
3. $4\overline{)84}$
4. $5\overline{)50}$
5. $2\overline{)32}$
6. $3\overline{)54}$
7. $4\overline{)96}$
8. $5\overline{)60}$
9. $6\overline{)73}$
10. $7\overline{)94}$
11. $2\overline{)99}$
12. $8\overline{)97}$

D-71 Complete the following division problems.

1. $2\overline{)124}$ 2. $3\overline{)156}$ 3. $2\overline{)154}$

4. $4\overline{)196}$ 5. $3\overline{)222}$

D-72 Complete the following division problems.

1. $5\overline{)190}$ 2. $6\overline{)606}$ 3. $7\overline{)907}$

4. $8\overline{)902}$ 5. $4\overline{)700}$

D-73 Complete the following division problems.

1. $3\overline{)9075}$ 2. $5\overline{)7250}$ 3. $6\overline{)9234}$

D-74 Complete the following multiplication problems.

1. $\begin{array}{r} 20 \\ \underline{\times\ 11} \end{array}$ 2. $\begin{array}{r} 60 \\ \underline{\times\ 32} \end{array}$ 3. $\begin{array}{r} 70 \\ \underline{\times\ 65} \end{array}$ 4. $\begin{array}{r} 80 \\ \underline{\times\ 97} \end{array}$ 5. $\begin{array}{r} 90 \\ \underline{\times\ 84} \end{array}$

D-75 Complete the following multiplication problems.

1. $\begin{array}{r} 31 \\ \underline{\times\ 26} \end{array}$ 2. $\begin{array}{r} 74 \\ \underline{\times\ 22} \end{array}$ 3. $\begin{array}{r} 83 \\ \underline{\times\ 32} \end{array}$ 4. $\begin{array}{r} 91 \\ \underline{\times\ 87} \end{array}$ 5. $\begin{array}{r} 63 \\ \underline{\times\ 13} \end{array}$

D-76 Complete the following multiplication problems.

1. $\begin{array}{r} 28 \\ \underline{\times\ 30} \end{array}$ 2. $\begin{array}{r} 480 \\ \underline{\times\ 40} \end{array}$ 3. $\begin{array}{r} 302 \\ \underline{\times\ 90} \end{array}$ 4. $\begin{array}{r} 518 \\ \underline{\times\ 20} \end{array}$ 5. $\begin{array}{r} 645 \\ \underline{\times\ 60} \end{array}$

D-77 Complete the following multiplication problems.

1. $\begin{array}{r} 34 \\ \underline{\times\ 52} \end{array}$ 2. $\begin{array}{r} 62 \\ \underline{\times\ 75} \end{array}$ 3. $\begin{array}{r} 67 \\ \underline{\times\ 46} \end{array}$ 4. $\begin{array}{r} 83 \\ \underline{\times\ 74} \end{array}$ 5. $\begin{array}{r} 95 \\ \underline{\times\ 78} \end{array}$

D-78 Complete the following multiplication problems.

1. $\begin{array}{r} 401 \\ \underline{\times\ 62} \end{array}$ 2. $\begin{array}{r} 702 \\ \underline{\times\ 40} \end{array}$ 3. $\begin{array}{r} 603 \\ \underline{\times\ 57} \end{array}$ 4. $\begin{array}{r} 805 \\ \underline{\times\ 93} \end{array}$ 5. $\begin{array}{r} 909 \\ \underline{\times\ 18} \end{array}$

D-79 Complete the following multiplication problems.

1. 500 x 75
2. 246 x 35
3. 487 x 46
4. 673 x 90
5. 498 x 89

D-80 Complete the following multiplication problems.

1. 300 x 400
2. 206 x 304
3. 175 x 543
4. 798 x 657

D-81 1. 38 x 43 estimated (not fully multiplied) to the nearest 100 is

a) 1500 b) 1200 c) 1600

2. 78 x 59 estimated to the nearest 100 is

a) 4800 b) 3500 c) 4200

D-82 Write the missing numbers in the blanks.

1. If 3 x N, then (1, 3), (2, 6), (4, ________).

2. If 5 x N, then (1, _______), (3, ________).

D-83 Name the "rule" used to form the number pairs.

Example: (1, 4), (2, 8), (3, 12). Rule is 4 x N.

1. (1, 2), (2, 4), (3, 6), (4, 8). Rule is ______________________.

2. (1, 7), (2, 14), (3, 21), (6, 42). Rule is ____________________.

D-84 Write the missing numbers in the blanks.

1. 4 ÷ 4 = _______
4 ÷ 2 = _______
4 ÷ 1 = _______
4 ÷ 0 = _______

2. 12 ÷ 6 = _______
12 ÷ 4 = _______
12 ÷ 3 = _______
12 ÷ 0 = _______

3. If 15 ÷ 3 = 5, then 15 = 3 x _______ .

If 15 ÷ 0 = _______, then 15 = 0 x _______.

D-85 Write the number sentence and the solution for each of the following.

1. Donna ordered 24 boxes of candy to distribute equally among 8 friends. How many boxes would each friend receive?

2. Jerry baked 48 cookies for a party of 12 of his friends. Equally distributed, this would be how many cookies for each of the 12 friends?

D-86 Draw lines from the words to the numbers they represent.

PRODUCT

5 x 3 = 15 24 ÷ 6 = 4

FACTORS

D-87 Draw lines from the words to the numbers they represent.

18 ÷ 3 = 6

DIVIDEND QUOTIENT DIVISOR

D-88 Write the missing numbers as mixed numbers.

Example: $7 \div 3 = 2\frac{1}{7}$.

1. 11 ÷ 5 = _______ 3. 25 ÷ 3 = _______

2. 19 ÷ 4 = _______ 4. 45 ÷ 17 = _______

D-89 Write the simplest name for each of the following.

1. (4 + 5) x (18 ÷ 6) = _______

2. (27 ÷ 3) + (7 + 9) = _______

3. (48 - 16) ÷ (2 x 8) = _______

D-90 Use parentheses to make each of the following statements true.

1. 4 x 6 ÷ 3 + 1 = 6

2. 3 + 9 ÷ 3 x 5 = 20

3. 12 ÷ 2 + 4 x 6 = 12

D-91 Write a story problem which would satisfy the following number sentences.

Example: 4 + 6 = _____. Jane has 4 books and Carla has 6 books. How many books is this?

1. 18 - 6 = _______

2. _____ x 5 = 15

D-92 Write a story problem which would satisfy the following number sentence.

(4 + 5) x 8 = _______

D-93 Write the number sentence and the solution for each of the following.

1. The Print Shop made 100 copies each of a set of 6 books. These are to be distributed equally to 8 schools. How many books will each school receive?

2. Five teams of students collected 18, 14, 26, 32, and 25 pop bottles. They decided to sell equal amounts to each of three stores. How many did they take to each store?

E-94 Write the simplest name for each of the following expressions.

1. 6 + 8 ÷ 2 x 4 = _______

2. 60 ÷ 6 - 3 x 3 = _______

3. 19 - 9 x 2 + 6 = _______

E-95 Name the quotient and remainder, if any.

1. $15\overline{)69}$

2. $20\overline{)98}$

3. $32\overline{)80}$

E-96 Name the quotient and remainder, if any.

1. $20\overline{)100}$

3. $50\overline{)308}$

2. $30\overline{)165}$

4. $70\overline{)450}$

E-97 Name the quotient and remainder, if any.

1. $10\overline{)120}$

2. $40\overline{)760}$

3. $60\overline{)854}$

4. $30\overline{)989}$

E-98 Name the quotient and remainder, if any.

1. $54\overline{)432}$

2. $231\overline{)924}$

3. $86\overline{)709}$

4. $127\overline{)450}$

E-99 Name the quotient and remainder, if any.

1. $21\overline{)861}$

2. $18\overline{)790}$

3. $43\overline{)905}$

4. $37\overline{)800}$

E-100 1. 795 ÷ 15 is nearest a) 50 b) 60 c) 500

2. 6483 ÷ 9 is nearest a) 60 b) 70 c) 700

3. 9076 ÷ 18 is nearest a) 400 b) 600 c) 500

E-101 Write the number sentence for and solve each of the following:

1. Mrs. Carr has a milk delivery route and drives 75 miles per day on Monday, Wednesday, and Friday, and 100 miles per day on Tuesday, Thursday, and Saturday. How many miles does she drive each week on her milk routes?

2. Mr. Cook and his lunchroom staff prepare 180 pieces of chicken and 225 meatballs for lunch. How many students can be served if the choice is two meatballs or 1 piece of chicken?

E-102 Write the missing number in each of the following sequences.

1. 3, 12, 48, _______.

2. 5, _______, 125, 625.

3. 9, 27, _______, 243.

E-103 Write the missing number in each of the following sequences.

1. 128, 32, 8, _______, 1.

2. 162, _______, 18, 6, 2.

3. 2592, 432, 72, _______, 2.

E-104 Name the missing number in each of the following.

1. 9 x (11 + 12) = _______ x 11 + 9 x 12.

2. 6 x (7 + _______) = 6 x 7 + 6 x 8.

3. _______ x (14 + 15) = _______ x 14 + _______ x 15.

E-105 Name all factors of:

1. 15 2. 12 3. 54

E-106 Rename each of the following as a product of primes. (Example: 12 = 2 x 2 x 3.)

1. 18 2. 24 3. 75

E-107 Name the common factors of each pair of numbers.

1. 15 and 25 2. 12 and 42

E-108 Name a common multiple of each of the following pairs of numbers.

1. 3 and 9
2. 6 and 8

E-109 Name the least common multiple of each of the following pairs of numbers.

1. 4 and 6
2. 9 and 12

E-110 Name the greatest common factor of each of the following pairs of numbers.

1. 15 and 18
2. 54 and 72

E-111 Name the quotient and remainder, if any, for each of the following.

1. $300\,\overline{)900}$
3. $400\,\overline{)5880}$
2. $100\,\overline{)509}$
4. $700\,\overline{)19063}$

E-112 Name the quotient and remainder, if any, for each of the following.

1. $21\,\overline{)252}$
3. $74\,\overline{)5790}$
2. $35\,\overline{)1085}$
4. $169\,\overline{)7964}$

F-113 Name all factors of:

1. 65
2. 100
3. 72

F-114 Rename each of the following in exponential form. (Example $2 \times 2 \times 2 = 2^3$.)

1. 3×3
2. $5 \times 5 \times 5 \times 5 \times 5 \times 5$

F-115 Rename each of the following in factor form.

1. 4^3
2. 7^4

F-116 Write the prime factors of each of the following in exponential form.

(Example: 36 = $3^2 \cdot 2^2$)

1. 24 2. 72 3. 100

F-117 Name the square of each of the following numbers.

1. 8 2. 10 3. 11

F-118 Name the square root of each of the following numbers.

1. 49 2. 81 3. 144

F-119 Name the greatest common factor of each of the following triples (3) of numbers. (Example: the G.C.F. of 4, 6, 8 is 2.)

1. 6, 12, 18 2. 30, 45, 75

F-120 Name the least common multiple (L.C.M.) of each of the following triples of numbers.

1. 5, 10, 15 2. 12, 21, 28

F-121 1. 1,928 is nearest in value to a) 1,000 b) 2,000 c) 1,900 d) 1,800.

2. 'Round' 56, 432 to the nearest 10,000.

3. 'Round' 43, 012, 658 to the nearest 1,000.

F-122 Name the cube of each of the following numbers.

1. 3

2. 5

F-123 Name the cube root of each of the following.

1. 8

2. 64

3. 27

F-124 Name the product of each of the following.

1. $\begin{array}{r} 29 \\ \underline{\text{x } 4} \end{array}$

2. $\begin{array}{r} 501 \\ \underline{\text{x } \ \ 6} \end{array}$

3. $\begin{array}{r} 200 \\ \underline{\text{x } \ \ 5} \end{array}$

4. $\begin{array}{r} 805 \\ \underline{\text{x } \ \ 7} \end{array}$

5. $\begin{array}{r} 7060 \\ \underline{\text{x } \ \ \ 9} \end{array}$

6. $\begin{array}{r} 57 \\ \underline{\text{x } 40} \end{array}$

7. $\begin{array}{r} 900 \\ \underline{\text{x } 76} \end{array}$

8. $\begin{array}{r} 803 \\ \underline{\text{x } 48} \end{array}$

9. $\begin{array}{r} 3050 \\ \underline{\text{x } 950} \end{array}$

10. $\begin{array}{r} 967 \\ \underline{\text{x } 487} \end{array}$

F-125 Name the quotients (whole and mixed numbers) of each of the following.

1. $6\overline{)186}$

2. $2\overline{)1618}$

3. $5\overline{)307}$

4. $9\overline{)6340}$

5. $70\overline{)528}$

6. $58\overline{)511}$

7. $40\overline{)1800}$

8. $18\overline{)1523}$

9. $92\overline{)19688}$

10. $56\overline{)224396}$

F-126 Write the number sentence for and solve each of the following.

1. A steam car uses 5 liters of water for every 10 liters of fuel.
   How much water does it use for 140 liters of fuel?

2. To make a model of a telescope students used an equal number of 14 centimeter (1 lb.) and 18 centimeter (2 lb.) high coffee cans.
   How many cans (1 and 2 lb.) would it take to make the model 160 centimeters long?

F-127 Name the missing number in each of the following.

1. 5 x 14 = (_______ x 10) + (_______ x 4).

2. 6 x _______ = (6 x 8) + (6 x 9).

3. _______ x 12 = (_______ x 10) + (_______ x 2).

RATIONAL NUMBERS STRAND

1979 Mathematics (K-8) Performance Objectives

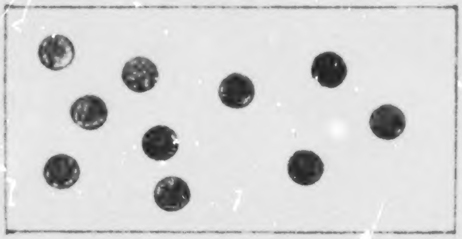
Test Items

Rational Numbers Strand

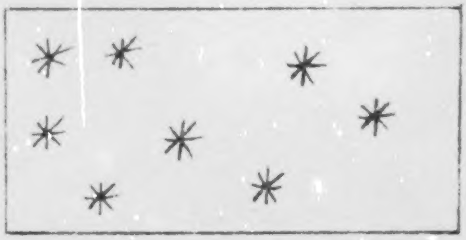
A-1 a) Place an even numbered set of counters $\leq$ 10 on child's desk. Ask child to place $\frac{1}{2}$ or $\frac{1}{4}$ of the set on a sheet of paper.

b) Place a piece of string or a rectangular/circular shaped piece of paper on child's desk. Ask child to fold object in half/fourths. (Could also draw lines or use colors to separate the regions.)

c) Have student circle an appropriate group (set) of marks.

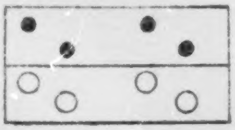


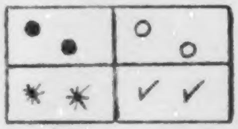
Draw a ring around $\frac{1}{2}$ the ●'s



Draw a ring around $\frac{1}{4}$ the ✱'s

A-2 a) Place equivalent sets of 2 or 4 different colored (or shaped) counters on child's desk in container(s) as shown.

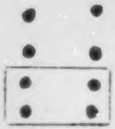




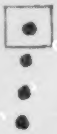
Ask, "What portion of the objects are white (etc.)?"

b) The above pictures could be appropriately colored rectangular/circular regions. Ask the same question.

B-2 a



What portion of the set is in the box?



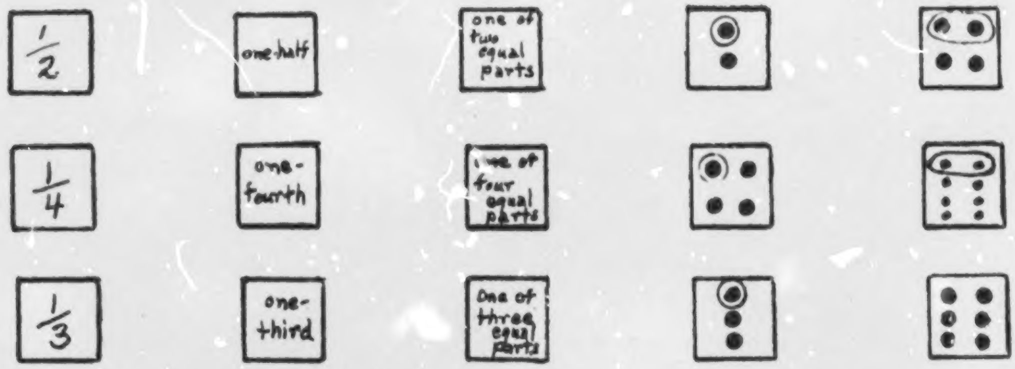
What portion of the set is in the box?

B-3 Repeat A-1, with $\leq$ 20 counters and "thirds," "halves," and "fourths."

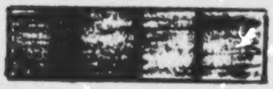
B-4 Repeat A-2 with $\leq$ 20 counters and "thirds," "halves," and "fourths."

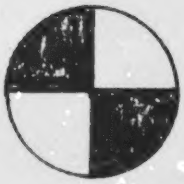
B-5 Have the numerals $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$ printed on cards for child to select or point to when completing B-4.

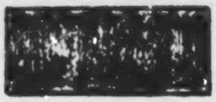
B-6 Teacher creates a set of cards for child to match, as shown below.

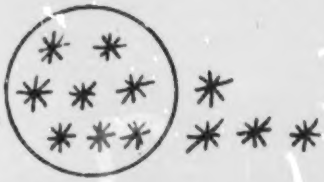

1/2
one-half
one of two equal parts
1/4
one-fourth
one of four equal parts
1/3
one-third
One of three equal parts

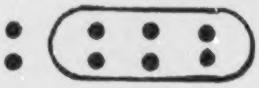
C-7 Write $\frac{1}{1}$, $\frac{2}{2}$, $\frac{2}{4}$, $\frac{2}{3}$, $\frac{3}{3}$, $\frac{3}{4}$, or $\frac{4}{4}$ in the blank next to the picture that each best represents.

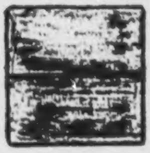
1.  ________

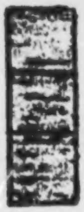
2.  ________

3.  ________

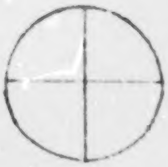
4.  ________

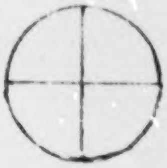
5.  ________

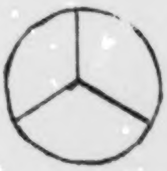
6.  ________

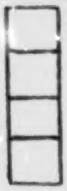
7.  ________

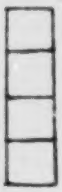
C-8 1. Shade the portion of the figure indicated by the fraction below it.

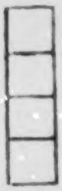

$\frac{1}{2}$


$\frac{1}{4}$


$\frac{1}{3}$


$\frac{1}{2}$


$\frac{1}{4}$


$\frac{1}{3}$

2. Circle the answer.

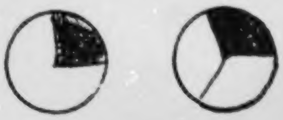
a) Which is least, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$?

b) Which is greatest, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{3}$?

C-9 Place $<$ or $>$ in each of the boxes to form true statements. Place the letter of the picture below in the blank next to the problem the picture best illustrates.

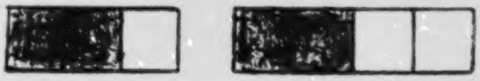
1. $\frac{1}{2}$ ☐ $\frac{1}{4}$ ______

a)



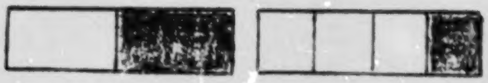
2. $\frac{1}{3}$ ☐ $\frac{1}{4}$ ______

b)



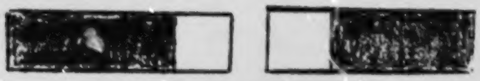
3. $\frac{3}{4}$ ☐ $\frac{2}{3}$ ______

c)



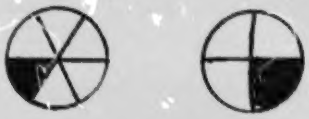
4. $\frac{1}{4}$ ☐ $\frac{1}{6}$ ______

d)

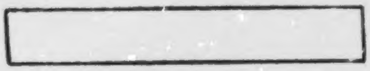


5. $\frac{2}{3}$ ☐ $\frac{2}{4}$ ______

e)



D-10 Shade the following boxes to picture the fraction listed.

1. $\frac{2}{6}$ 2. $\frac{3}{8}$ 

3. Mark the portion of a line below to picture $\frac{1}{10}$ of the segment.

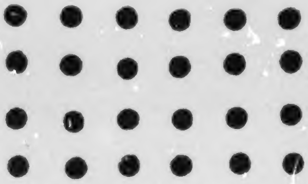
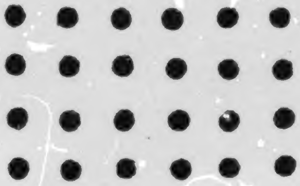
D-11 Place $\leq$ 100 identical counters on child's desk. Ask student to use the counters to illustrate any three of the following fractions (use reasonable variety):

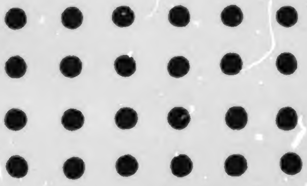
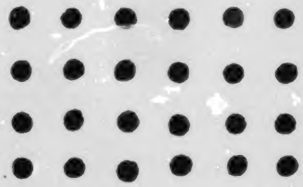
$\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{16}$, $\frac{2}{2}$, $\frac{2}{3}$, $\frac{2}{4}$, $\frac{2}{6}$, $\frac{2}{8}$, $\frac{3}{3}$, $\frac{3}{4}$,

$\frac{3}{6}$, $\frac{3}{8}$, $\frac{4}{4}$, $\frac{4}{6}$, $\frac{4}{8}$, $\frac{6}{8}$.

Also prepare cards with these numerals and with pictures of regions representing these numbers for the students to match.

D-12 Draw a closed curve around a portion of the dots to show:

1. $\frac{1}{2}$  2. $\frac{2}{4}$ 

3. $\frac{4}{8}$  4. $\frac{3}{6}$ 

5. Name the equal fractions in 1 - 4.

D-13 Draw lines from the words to the numerals they name.

Numerator $\frac{7}{8}$ Denominator

D-14 1. Write the like fractions in the rectangles from the list below.

$\frac{1}{8}$

$\frac{3}{4}$, $\frac{7}{8}$, $\frac{1}{4}$, $\frac{2}{8}$, $\frac{9}{12}$, $\frac{1}{8}$

2. Write three unlike fractions in the rectangle below from the list above.

D-15 Add the following:

1. $\frac{2}{5} + \frac{2}{5} =$ ______
3. $\frac{3}{10} + \frac{5}{10} =$ ______
2. $\frac{1}{2} + \frac{2}{2} + \frac{3}{2} =$ ______
4. $\frac{7}{16} + \frac{4}{16} =$ ______

D-16 Subtract the following:

1. $\frac{7}{8} - \frac{2}{8} =$ ______
3. $\frac{12}{5} - \frac{9}{5} =$ ______
2. $\frac{9}{10} - \frac{5}{10} =$ ______
4. $\frac{6}{6} - \frac{2}{6} =$ ______

D-17 Write two equivalent fraction names for each of the following:

(Example: $\frac{1}{8} = \frac{2}{16} = \frac{3}{24}$.)

1. $\frac{1}{2} =$ ____ $=$ ____
4. $\frac{1}{1} =$ ____ $=$ ____
2. $\frac{1}{3} =$ ____ $=$ ____
5. $\frac{1}{5} =$ ____ $=$ ____
3. $\frac{1}{4} =$ ____ $=$ ____
6. $\frac{1}{10} =$ ____ $=$ ____

D-18 1. Draw lines from the words to the type of fraction they name.

a) proper fraction $\frac{4}{12}$ $\frac{7}{6}$

b) improper fraction

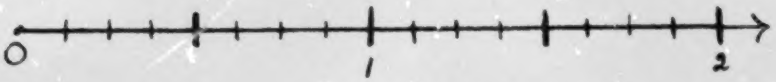
2. Write an improper fraction different from the one above. ____

D-19 Draw a line from each fraction to its position on the number line.

$\frac{3}{2}$

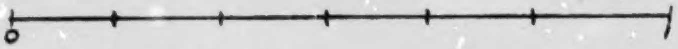
$\frac{6}{8}$

$\frac{\text{[illegible]}}{4}$

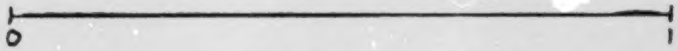


D-20 Write the two numerals at the proper spot on the number line and place < or > in the box to form a true statement.

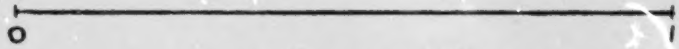
1. $\frac{1}{2}$ ☐ $\frac{1}{3}$



2. $\frac{1}{6}$ ☐ $\frac{1}{4}$



3. $\frac{1}{5}$ ☐ $\frac{1}{10}$



D-21 Rename each improper fraction as a mixed number.

(Example: $\frac{17}{9} = 1\frac{8}{9}$.)

1. $\frac{3}{2}$ = ________

2. $\frac{9}{4}$ = ________

3. $\frac{15}{4}$ = ________

4. $\frac{12}{5}$ = ________

D-22 Rename each mixed number as an improper fraction.

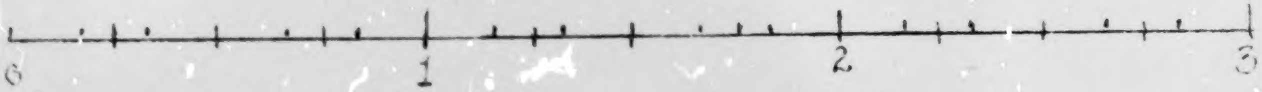
1. $1\frac{2}{3}$ = ________

2. $4\frac{1}{2}$ = ________

3. $3\frac{7}{8}$ = ________

4. $5\frac{3}{4}$ = ________

E-23 Write the numerals $1\frac{1}{4}$, $2\frac{2}{3}$, $1\frac{5}{8}$ next to a "dot" placed at the proper place on the number line shown.



E-24 Write two equivalent fraction names for each of the following. (Example: $\frac{1}{2} = \frac{3}{6} = \frac{12}{24}$.)

1. $\frac{2}{3}$ = _____ = _____
2. $\frac{3}{4}$ = _____ = _____
3. $\frac{5}{6}$ = _____ = _____
4. $\frac{7}{8}$ = _____ = _____

E-25 Name the missing number in each of the following.

1. $\frac{2}{5} = \frac{\quad}{10}$
2. $\frac{3}{8} = \frac{6}{\quad}$
3. $\frac{3}{5} = \frac{\quad}{25}$
4. $\frac{\quad}{8} = \frac{15}{24}$

E-26 Name the least common denominators (L.C.D.) of each of the following sets of fractions.

1. $\frac{1}{3}$, $\frac{1}{4}$
2. $\frac{2}{3}$, $\frac{4}{5}$
3. $\frac{5}{6}$, $\frac{7}{8}$
4. $\frac{1}{3}$, $\frac{1}{6}$, $\frac{2}{9}$

E-27 Place $<$, $=$, or $>$ in the boxes below to form true statements. Show your reasoning to the right of each problem.

1. $\frac{2}{3}\ \square\ \frac{3}{5}$.
2. $\frac{7}{8}\ \square\ \frac{5}{6}$.

E-28 Add each pair of fractions below.

1. $\frac{1}{2} + \frac{1}{4} =$ ________ 3. $\frac{2}{3} + \frac{1}{4} =$ ________

2. $\frac{1}{3} + \frac{1}{2} =$ ________ 4. $\frac{3}{4} + \frac{1}{3} =$ ________

E-29 Subtract each pair of fractions below.

1. $\frac{1}{2} - \frac{1}{4} =$ ________ 3. $\frac{1}{3} - \frac{1}{4} =$ ________

2. $\frac{1}{2} - \frac{1}{3} =$ ________ 4. $\frac{3}{4} - \frac{2}{3} =$ ________

E-30 Complete each of the following.

1. $\frac{2}{3} - \frac{3}{5} =$ ________ 3. $\frac{3}{4} - \frac{5}{8} =$ ________

2. $\frac{3}{4} + \frac{2}{3} =$ ________ 4. $\frac{3}{8} + \frac{5}{6} =$ ________

E-31 Complete each of the following.

1. $1\frac{2}{3} + 3\frac{1}{2} =$ ________ 4. $7\frac{3}{16} + 1\frac{1}{2} =$ ________

2. $4\frac{5}{6} - 2\frac{3}{4} =$ ________ 5. $5\frac{1}{10} + 8\frac{3}{4} =$ ________

3. $6\frac{3}{10} \quad 2\frac{4}{5} =$ ________ 6. $10\frac{3}{8} - 4\frac{2}{3} =$ ________

E-32 Write the number sentence for and solve each of the following.

1. It rained $\frac{1}{2}$ inch Wednesday and $\frac{2}{10}$ inch on Thursday. How much rain fell during the two days?

2. My gas tank was $\frac{3}{4}$ full this morning and $\frac{1}{3}$ full this evening. What fraction of the tank of gas was used today.

F-33 Use $<$, $=$, or $>$ to complete each of the following.

1. $\frac{5}{6} \; \square \; \frac{9}{12}$
3. $\frac{3}{5} \; \square \; \frac{4}{7}$
2. $\frac{4}{9} \; \square \; \frac{9}{18}$
4. $\frac{7}{8} \; \square \; \frac{13}{15}$

F-34 Circle the fractions that are in simplest form (the numerator and denominator have no common factor > 1 —— are mutually prime).

$\frac{4}{6}$, $\frac{9}{15}$, $\frac{5}{18}$, $\frac{10}{24}$, $\frac{9}{25}$, $\frac{13}{39}$

F-35 Give the simplest name of each of the following.

1. $\frac{5}{15}$
3. $\frac{6}{32}$
5. $\frac{25}{125}$
2. $\frac{9}{12}$
4. $\frac{18}{64}$
6. $\frac{16}{72}$

F-36 Give the simplest name for each of the following.

1. $\frac{2}{5} + \frac{3}{15} =$ ______
3. $\frac{2}{3} + \frac{4}{12} =$ ______
2. $\frac{2}{8} + \frac{3}{10} =$ ______
4. $\frac{2}{5} + \frac{4}{9} =$ ______

F-37 Give the simplest name for each of the following.

1. $\frac{3}{4} - \frac{2}{8} =$ ______
3. $\frac{6}{10} - \frac{1}{12} =$ ______
2. $\frac{2}{3} - \frac{4}{12} =$ ______
4. $\frac{9}{15} - \frac{3}{9} =$ ______

F-38 Write the number sentence for and solve each of the following.

1. Sue rode $\frac{3}{4}$ of a kilometer on her bike, then walked $\frac{1}{10}$ of a kilometer. How much further did she ride than walk?
2. A cake recipe calls for $2\frac{1}{3}$ cups of sugar. An additional $\frac{3}{4}$ cup of sugar is needed for the frosting. How much sugar is needed in all?
3. A designer purchased $4\frac{5}{8}$ yards of material and used $1\frac{1}{2}$ yards to make a blouse. How much more material is needed to make a skirt that takes $3\frac{1}{4}$ yards?

F-39 Write the simplest name for each of the following.

1. $\frac{5}{8} \times \frac{2}{3} =$ ________

2. $\frac{2}{6} \times \frac{3}{5} =$ ________

3. $\frac{3}{4} \times \frac{7}{12} =$ ________

4. $\frac{9}{15} \times \frac{10}{24} =$ ________

F-40 Write the simplest name for each of the following.

1. $4 \times \frac{3}{8} =$ ________

2. $\frac{3}{5} \times 20 =$ ________

3. $15 \times \frac{4}{9} =$ ________

4. $\frac{9}{64} \times 12 =$ ________

F-41 Name the reciprocal of each of the following.

1. 5

2. $\frac{1}{4}$

3. $\frac{5}{9}$

F-42 Rename each of the following as a whole or mixed number.

1. $\frac{5}{3}$

2. $\frac{17}{5}$

3. $\frac{39}{2}$

F-43 Rename each of the following as an improper fraction.

1. $1\frac{3}{4}$

2. $7\frac{5}{9}$

3. $10\frac{2}{3}$

F-43a Give the simplest name for each of the following.

1 1/2 + 2 5/6 = ________

7 3/4 + 11 2/3 = ________

106 5/8 + 2 1/3 = ________

24 1/4 - 5/8 = ________

30 - 6 5/6 = ________

9 1/3 - 2 7/8 = ________

F-44 Give the simplest name for each of the following.

1. $3 \times 1\frac{1}{2} =$ ______

2. $12 \times 2\frac{3}{4} =$ ______

3. $5\frac{7}{8} \times 24 =$ ______

4. $9\frac{5}{6} \times 20 =$ ______

F-45 Give the simplest name for each of the following.

1. $1\frac{1}{2} \times 2\frac{3}{4} =$ ______

2. $2\frac{4}{7} \times 8\frac{1}{6} =$ ______

3. $10\frac{7}{8} \times 5\frac{1}{3} =$ ______

4. $3\frac{2}{3} \times 4\frac{5}{6} =$ ______

F-46 Name a fraction between each of the following.

1. $\frac{1}{4}$, $\frac{3}{4}$

2. $\frac{1}{4}$, $\frac{1}{2}$

3. $\frac{1}{3}$, $\frac{2}{3}$

F-47 Write the number sentence for and solve each of the following.

1. A logging company cut the trees on $\frac{1}{2}$ of a tree farm. They then reseeded $\frac{2}{3}$ of the cut area. What part of the tree farm was reseeded?

2. Your pickup holds $\frac{3}{4}$ ton of topsoil. You dump $\frac{2}{3}$ of this on a garden. What part of a ton remains in the pickup?

F-48 Give the simplest name for each of the following.

1. $8 \times 1\frac{1}{2} \times \frac{7}{4} =$ ______

2. $\frac{3}{2} \times 20 \times \frac{15}{6} =$ ______

3. $\frac{8}{9} \times \frac{18}{5} \times 7 =$ ______

4. $24 \times \frac{9}{10} \times \frac{7}{2} =$ ______

F-49 Name the reciprocal of each of the following.

1. 8

2. $\frac{7}{11}$

3. $\frac{15}{2}$

4. $3\frac{2}{3}$

F-50 Give the simplest name for each of the following.

1. $4 \div \frac{1}{2} =$ ______

2. $18 \div \frac{2}{3} =$ ______

3. $20 \div \frac{2}{5} =$ ______

4. $25 \div \frac{3}{5} =$ ______

F-51 Give the simplest name for each of the following.

1. $\frac{3}{4} \div \frac{1}{2} =$ _______

2. $\frac{7}{8} \div \frac{1}{4} =$ _______

3. $\frac{5}{6} \div \frac{2}{3} =$ _______

4. $\frac{7}{9} \div \frac{4}{5} =$ _______

F-52 Give the simplest name for each of the following.

1. $1\frac{2}{3} \div \frac{1}{2} =$ _______

2. $2\frac{1}{2} \div \frac{5}{2} =$ _______

3. $4\frac{7}{8} \div \frac{3}{4} =$ _______

4. $10\frac{3}{8} \div \frac{1}{4} =$ _______

F-53 Give the simplest name for each of the following.

1. $\frac{3}{4} \div 1\frac{2}{3} =$ _______

2. $\frac{7}{9} \div 2\frac{1}{2} =$ _______

F-54 Give the simplest name for each of the following.

1. $4\frac{1}{2} \div 2 =$ _______

2. $5\frac{1}{8} \div 4 =$ _______

3. $10\frac{2}{3} \div 3 =$ _______

4. $12\frac{1}{4} \div 4 =$ _______

F-55 Give the simplest name for each of the following.

1. $9 \div 1\frac{1}{2} =$ _______

2. $10 \div 1\frac{1}{4} =$ _______

3. $12 \div 2\frac{2}{3} =$ _______

4. $32 \div 3\frac{3}{4} =$ _______

F-56 Name a number less than $\frac{1}{64}$. _______

How many numbers can you name that are less than $\frac{1}{64}$?

____

GEOMETRY STRAND

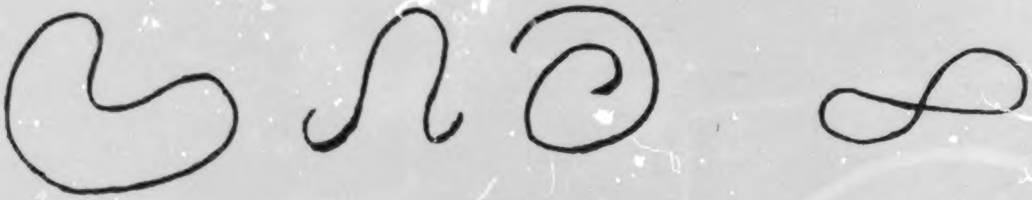
1979 Mathematics (K-8) Performance Objectives

Test Items

Geometry Strand

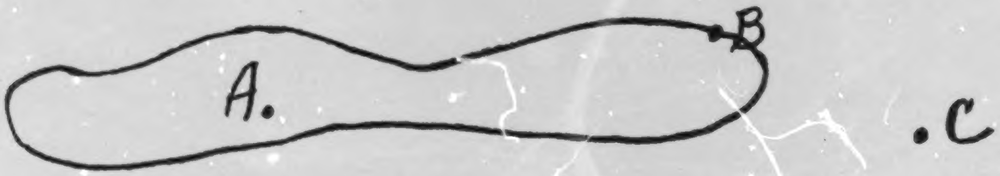
K-1 1. Teacher marks two dots (points) on piece of paper.
2. Ask child to draw a path, mark, or line with a pencil to connect these points. The line may be curved or straight.
3. Ask child to point to the endpoints of the path.

K-2 Ask child to point to the: 1. open curves, 2. closed curves.



K-3 Ask child which of the dots (points) is:

1. in the interior (inside) of the closed curve, 2. in the exterior (outside) of the closed curve, 3. on (in) the curve.



4. Ask child to place other points in the interior, of exterior of, and on the closed curve.

K-4 Place five objects or pictures of five objects, two or three of which are congruent (identical), on child's desk. Ask, "Which objects are exactly alike, congruent?"

K-5 Place five objects or pictures of objects, two or three of which are similar (dimensions proportional), on child's desk. Ask, "Which of the objects are similar?" (Congruent objects are also similar.)

K-6 Use any simple objects, but attribute blocks are suggested. Ask student, "Tell me about this block." Other leading questions may be, "What color is it?", "What shape is it?", "What size is it?", "What is the object used for?", etc.

K-7 Obtain take-apart models of toy cars, or blocks cut into 4 or 5 pieces for child to reassemble. Completed model should be available for child to view.

K-8/A-18

Have physical models and/or pictures of the listed geometric shapes available. Have the names printed on cards, one per card. Child places name (on card) adjacent to object it names and says the name.

A-19 Place models of triangles, squares, and rectangles on child's desk. Say, "Place your finger tip on a corner of the __________. On a side of the __________. Move your finger along the side of the __________."

B-20/B-22

Do as in K-8 through A-18.

B-23 Do as in A-19.

B-24 Alternatives:

1. Have models and ask child to name the geometric figures represented by the faces and bases of the models.
2. Have the names "circle," "triangle," "square," "rectangle," printed on cards, one set for each student. As you hold model and point to a face, have student hold up card naming that face. A "quiet" lesson.

B-25 Place paper models of circle, square, rectangle, ellipse, and isosceles triangle on child's desk. Ask child to fold model along the line of symmetry. (Suggest also using one non-symmetrical triangle for the most able students.)

C-26 Place set of paper models of congruent and non-congruent polygones, circles, and ellipses on child's desk. Ask child to find the pairs (or triples) of congruent figures. Checks congruency by superposition of figures.

C-27 Place a set of paper models of squares, circles, equilateral triangles, non-square rectangles, ellipses and scalene triangles on child's desk. Ask child to find the pairs (or triplets) of similar figures. Uses superposition to check similarity.

C-28/D-55

Teacher prepares two sets of cards. One set lists each name, one per card, listed in C-28 through D-55. The other set contains at least one picture, one per card, for each listed name.

1. Child matches names to pictures. (May need physical model of skew lines.)

2. Given the name, child can draw the picture. (Use physical model for skew lines.)

3. Given 3-dimensional models of any of these items, but especially D-50 through D-55, the student can write the name of the model.

D-56 How many straight lines can be drawn through points M and N at the same time?

M·   ·N

D-57 How many straight lines can be drawn through point C? C·

D-58 1. Given segment $\overline{AB}$, how many points are in the segment between A and B? A•————————•B

2. Given line $\overleftrightarrow{AB}$, how many points are in the line?

3. How large is a point? (Very small, or has no size, etc.)

D-59 Place two dowel sticks or straight pieces of wire on child's desk. Ask child to illustrate the ways (parallel, intersect, skew) the lines can exist in space. (There are many ways to illustrate any of the three basic relationships.) Ask: "In how many points do they intersect?" --- when they intersect.

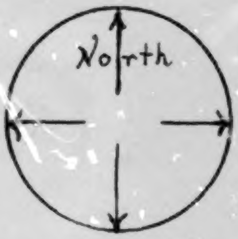
D-60 Ask child to measure the distance between two points on different walls of the classroom. Observe the procedure. (The measure is unimportant.)

D-61 Ask child to determine which of two surfaces, one curved and one a plane, is nearest to being a plane surface. Ask for "proof." (Use of straight edge is a very acceptable proof.)

D-62 Have models of plane, spherical, and curved (but not spherical) surfaces available and three cards with each name on one card. Ask child to place the name adjacent to the correct model.

D-63 Having drawings (models) of 3 to 5 acute and botuse angles, each model on a different card. Have child arrange cards by sight, from the least to the greatest measure.

D-64 Draw the following picture on a paper placed on the child's desk. Direct the child as follows: "Label the arrows "South," "East," and "West" to match the compass directions."



D-65 Have models (3-D or drawings) of isosceles (various), equilateral, and scalene (various) triangles available. Have each of these names on separate cards. Ask student to place the correct name adjacent to the model.

D-66 1. Draw a picture of a quadrilateral, a pentagon, a hexagon.

2. Complete the following chart.

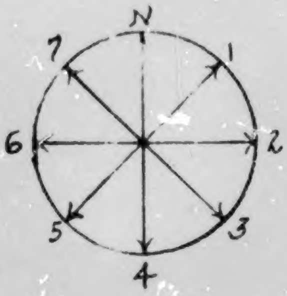
	quadrilateral	pentagon	hexagon
number of sides			
number of angles			
number of vertices			

D-67 1. Draw a picture of a circle, a triangle, a square.

2. Draw a picture of a circular region, a triangular region, a square region.

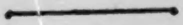
D-68 Have cardboard models of a wide variety of triangles, several pairs or triples of which are similar (including some congruent triangles). Ask student to place the groups of similar triangles in separate piles, the smallest on top. (Parallelism of corresponding sides will probably be the criteria for similarity.)

E-69 Place the labels "NW", "SW", "SE", "NE", "E", "S", "W", opposite the number representing that direction on the pictured compass.



1. ____________
2. ____________
3. ____________
4. ____________
5. ____________
6. ____________
7. ____________

E-70 Use compasses and the length of the segment below as radius to draw a circle in the space provided.



E-71 Use the ruler provided to name the measure of the diameter of the circle above.

Answer: ____________ cm.

E-72 Place the numeral to the left of the definition next to the word defined. (Better still, have the child orally define each word. Accept reasonable approxmations.)

1.	A segment whose endpoints are the circle and the center of the circle.	Circle ____________
2.	The set of points in a plane equidistant from a point of the plane.	Radius ____________
3.	A segment through the center of the circle with its endpoints on the circle.	Diameter ____________

E-73 Name the geometric figure represented by one-half a spherical orange. (Better, have a model available, have the child name it, it's center, radius, and diameter.)

Answer: ____________

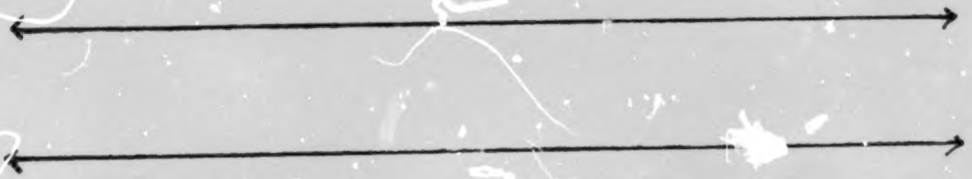
E-74 Which of the following is the best definition of two parallel lines? (Better, have the student orally define this. Accept reasonable approxmations.)

Answer: ____________

1. Two lines that do not intersect.
2. Two lines in the same plane that do not intersect.
3. Two lines that intersect.

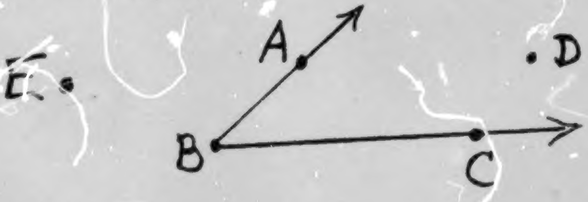
E-75 The picture below represents two parallel lines. Measure the distance between these lines.

Answer: ____________ cm.



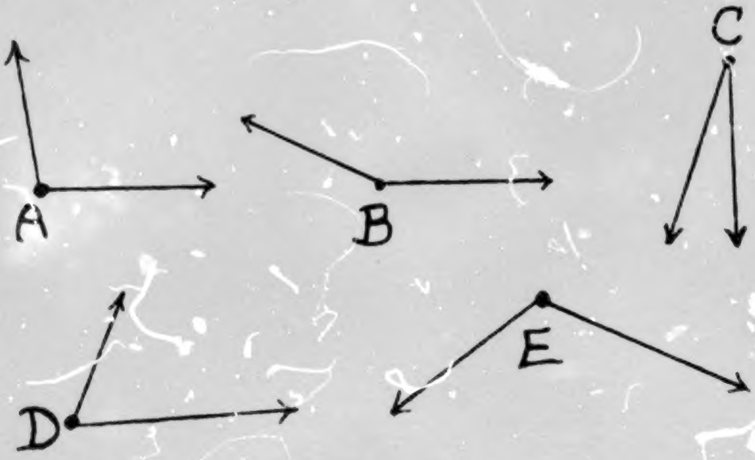
E-76 Which of the points (A, B, C, D, E) is in the interior of the pictured angle?

Answer: ____________



E-76a What is the degree measure of a right angle?

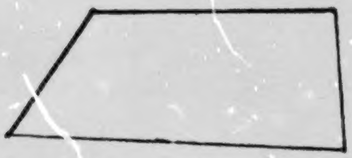
E-77 List the acute and obtuse angles pictured below, using the letter at their vertex.

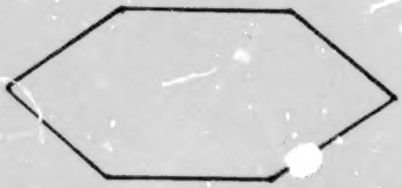


Acute: ____________

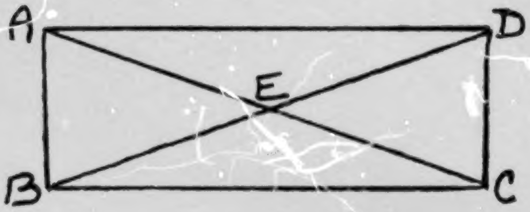
Obtuse: ____________

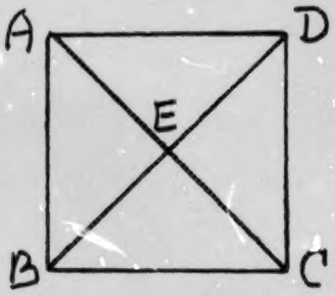
E-78 Draw all of the diagonals of each of the following figures.





E-79 In any rectangle (two rectangles are pictured), which of the following statements are always true?





AC is congruent to BD. T - F

BE is congruent to DE. T - F

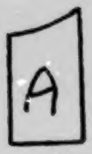
BE is congruent to CE. T - F

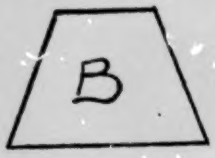
AC is longer than BD. T - F

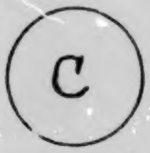
BD is longer than AC. T - F

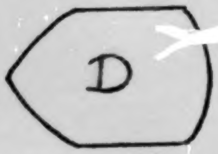
E-80 Name the figures that have line symmetry. ____________________

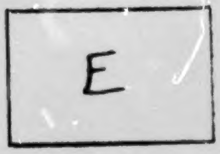
Name the figures that have point symmetry. ____________________



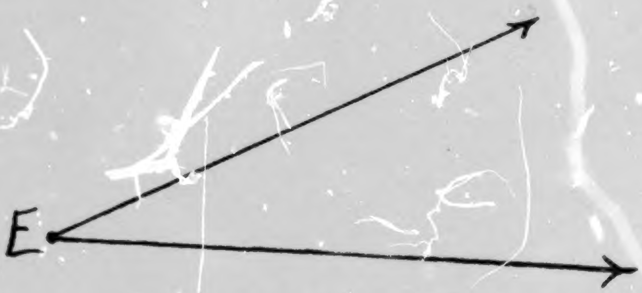








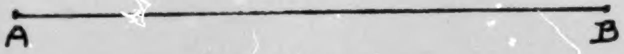
E-81 Use compasses to bisect the angle pictured.



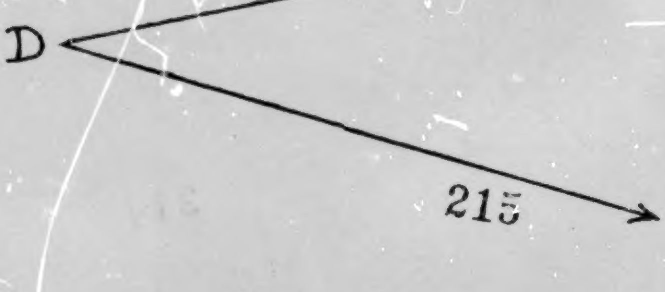
E-81a 1. Define an acute angle.

2. Define an obtuse angle.

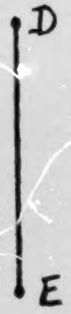
E-82 Use compasses to construct on your paper a segment congruent to $\overline{AB}$.



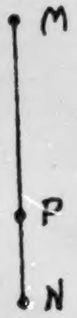
E-83 Use compasses to construct on your paper an angle congruent to $\angle D$.



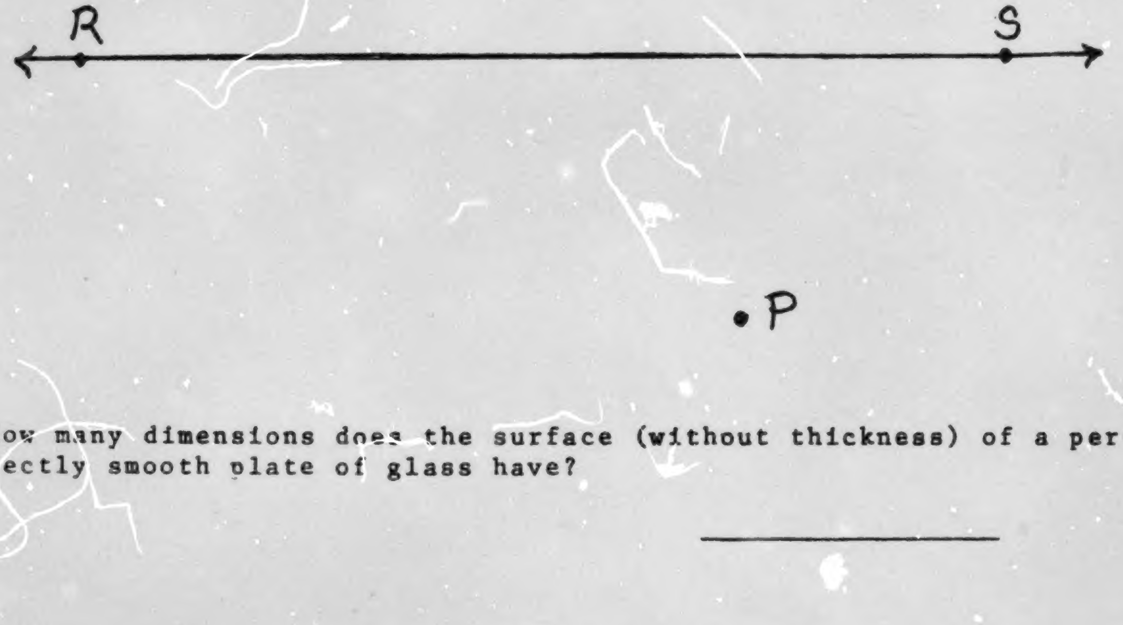
E-84 Use compasses to construct the perpendicular bisector of the segment $\overline{DE}$.



E-85 Use compasses to construct a line perpendicular to $\overline{MN}$ at point P.



E-86 Use compasses to construct a line perpendicular to $\overleftrightarrow{RS}$ from point P.



F-87 How many dimensions does the surface (without thickness) of a perfectly smooth plate of glass have?

____

F-88 How many dimensions does the set of all points have?

____

F-89 Have models of cones, pyramids, prisms available. Ask student to identify vertices of each.

F-90 Have models of pyramids and prisms available. Ask student to identify vertices of each.

F-91 Have an open-top box or wire models of prisms available. Ask student to use a string to form a diagonal of the prism.

DECIMALS

1979 Mathematics (K-8) Performance Objectives

Test Items

Decimals

E-1 Name the decimal equivalent of each of the following:

1. $\frac{1}{10}$ = ________

2. $\frac{1}{100}$ = ________

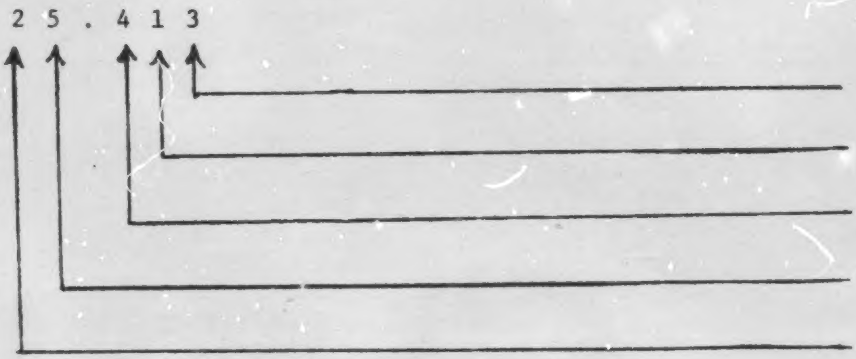
3. $\frac{4}{10}$ = ________

4. $\frac{3}{100}$ = ________

5. $2\frac{5}{10}$ = ________

6. $\frac{515}{100}$ = ________

E-2 Write the word name for the place value of each digit in the number below:



E-3 Write each of the following in expanded notation.

Example: $12.3 = 10 + 2 + \frac{3}{10}$

1. 25.6 = ____________________

2. 4.361 = ____________________

3. 10.708 = ____________________

E-4 1. Which one of the following correctly names 1.203?

a) one thousand two hundred three

b) one and two hundred three thousandths

c) one and twenty-three thousandths

2. Which one of the following correctly names 56.01?

a) fifty-six and one one-hundreth.

b) five thousand six hundred and one.

c) fifty-six and one tenth

E-5 1. Which one of the following correctly names forty-two and thirteen hundreths?

a) 4213 b) 42.13 c) 4213.1

2. Which one of the following correctly names fifty and eighteen thousandths?

a) 50.018 b) 50.18 c) .5018

E-6 1. Which list of numbers is in order from least to greatest?

a) .6, .06, .006

b) .006, .06, .6

c) .06, .006, .6

2. Which of the following sets of numbers is in order from least to greatest?

a) .007, .213, .3

b. .5, .10, .42

c. .15, .28, .052

E-7 1. The number 28.19 rounded to the nearest tenth is:

a) 28.0 b) 28.1 c) 28.2

2. The number 47.426 rounded to the nearest hundreth is:

a) 47.4 b) 47.43 c) 47.42

E-8 Rename each of the following as a decimal fraction.

1. $\frac{7}{100} =$ _______
2. $\frac{10}{100} =$ _______
3. $\frac{8}{1000} =$ _______
4. $\frac{75}{1000} =$ _______
5. $\frac{225}{1000} =$ _______
6. $\frac{1475}{1000} =$ _______

E-9 Rename each of the following as fractions or mixed numbers.

1. .15 = _______
2. .08 = _______
3. .481 = _______
4. .390 = _______
5. 3.17 = _______
6. 1.01 = _______

E-10 Name the sum of each of the following.

1. $\begin{array}{r} 143.01 \\ 18.790 \\ +\ 76.834 \\ \hline \end{array}$

2. 52.108 + 1.19 + 127.2 = _______

E-11 Subtract each of the following.

1. $\begin{array}{r} 493.7 \\ -\ 68 \\ \hline \end{array}$

2. 856.04 - 175 = _______

E-12 Subtract each of the following.

1. $\begin{array}{r} 675.017 \\ -156.54 \\ \hline \end{array}$

2. 1014.702 - 304.18 = _______

E-13 Subtract each of the following.

1. $\begin{array}{r} 271 \\ -\ 15.8 \\ \hline \end{array}$

2. 765 - 96.04 = _______

E-14 Write a number sentence for and solve each of the following.

1. Jan rode her bicycle 2.3 km to the store to purchase pencils. Then she rode 1.4 km to school. How far did she ride?

2. Jon recorded 2.1 cm of rain at noon one day. His father read the guage in the evening and the day's total rain was 4.5 cm. How much rain fell during the afternoon?

E-15 Multiply each of the following.

1. 19.8 x 10 = _______ 3. 22.08 x 100 = _______

2. 27.6 x 100 = _______ 4. 95.14 x 1000 = _______

E-16 Multiply each of the following.

1. 12.3 x 0.1 = _______ 3. 92.34 x 0.001 = _______

2. 17.41 x 0.01 = _______ 4. 100.011 x 0.001 = _______

E-17 Multiply each of the following.

1. $\begin{array}{r} 4567 \\ \underline{\times\ 3.71} \end{array}$ 2. $\begin{array}{r} 2413 \\ \underline{\times\ 1.08} \end{array}$ 3. $\begin{array}{r} 12345 \\ \times\ \underline{6.007} \end{array}$

E-18 Multiply each of the following.

1. $\begin{array}{r} 52.1 \\ \underline{\times\ 2.8} \end{array}$ 2. $\begin{array}{r} 613.4 \\ \underline{\times\ 7.15} \end{array}$ 3. $\begin{array}{r} 9.2106 \\ \underline{\times\ 19.70} \end{array}$

E-19 Write a number sentence for and solve each of the following.

1. If a cheetah can run at the rate of 45 meters per second, how far would it travel in 4.8 seconds?

2. Mel's trip was 35.25 miles. How many kilometers did Mel travel if each mile is 1.6 km?

F-20 1. Which list of numbers is in order from least to greatest?

a) 0.005, 0.421, 0.5

b) 0.4, 0.30, 0.153

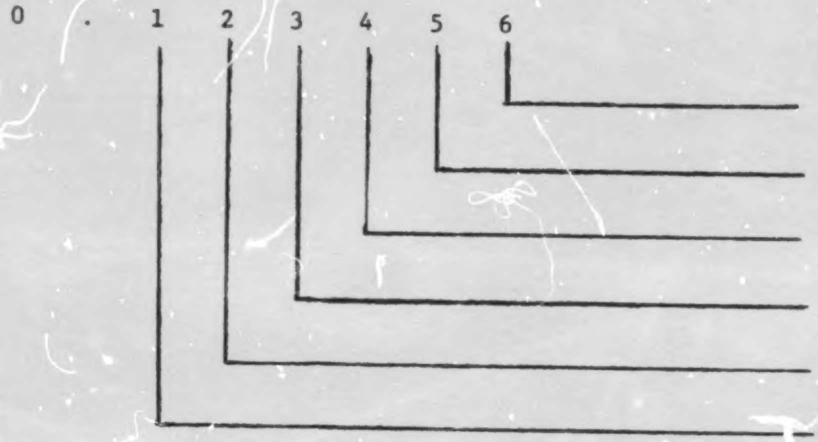
c) 0.1, 0.004, 0.00008

F-21 1. Which of the following is equivalent to $\frac{1}{4}$?

a) 0.25 b) 2.5 c) 0.50

2. Write the decimal equivalent of $\frac{1}{8}$. _______

F-22 Write the word name for the place value of each digit in the number below:



F-23 Write the word name for 1.54362. ____________________________

F-24 Write the numeral for each of the following decimal fractions.

1. Three and five hundred twenty-three thousandth. ______________

2. One hundred twenty-five thousand, two hundred forty-eight millionths.

____

F-25 1. The number 5.46847 rounded to the nearest thousandth is:

a) 5.4685   b) 5.468   c) 5.469

2. The number 0.337986 rounded to the nearest tenth is:

a) 0.3   b) 0.4   c) 0.34

F-26 Complete each of the following divisions.

1. $54\overline{)9.2316}$ 2. $128\overline{)10.06750}$

F-27 Complete each of the following divisions.

1. $3.1\overline{)4168}$ 2. $5.2\overline{)1064}$

F-28 Complete each of the following divisions.

1. $1.08\overline{)3149}$ 2. $0.015\overline{)6780}$

F-29 Complete each of the following divisions.

1. $2.05\overline{)91.70}$ 2. $0.132\overline{)712.34}$

F-30 Write a number sentence for and solve each of the following.

1. The length of a meter is about 39.37 inches. What is the number of inches in 3.5 meters?

2. The wall is 33.25 meters long. How many file cabinets, each 0.46 meters wide, can we place along this wall?

PROPORTION, PERCENT

1979 Mathematics (K-8) Performance Objectives

Test Items

Proportion, Percent

C-1 1. The statement "Three oranges per 38 cents," means:

a) 1 orange costs 38 cents.

b) 3 oranges cost 38 cents.

2. The statement "Two balls/$1.50," means:

a) 2 balls cost $1.50.

b) 1 ball costs $1.50.

D-2 1. The ratio "2 apples per 15 cents," is equivalent to:

a) 3 apples per 20 cents

b) 4 apples per 30 cents

c) 5 apples per 40 cents

2. The ratio "4 pencils/30 cents," is equivalent to:

a) 8 pencils/15 cents

b) 1 pencil costs 30 cents

c) 2 pencils/15 cents

D-3 1. Which ratio describes the number of circles compared to the number of squares?

○ ○ ○ ○ □ □ □ □ □

a) 4/5 b) 5/4 c) 4/9

2. Which ratio describes the number of shaded circles compared to the number of circles?

● ● ● ○ ○ ○ ○ ○

a) 3/5 b) 5/3 c) 3/8

E-4 1. Which of the following ratios is equivalent to 3/5?

a) 9/25 b) 6/10 c) 9/10

2. Which of the following is a true statement?

a) $\frac{2}{3} \cdot \left(\frac{3}{3}\right) = \frac{6}{9}$ b) $\frac{5}{6} = \frac{25}{36}$ c) $\frac{6}{12} = \frac{18}{24}$

F-5 1. The simplest name for the ratio of 300 kgm to 1200 kgm is:

a) 300/1200 b) 3/12 c) 1/4

2. The simplest name for the ratio of 1500 meters to 75 meters is:

a) 1500/75 b) 100/5 c) 20/1

F-6 & 7 I deleted. They seem redundant.

F-8 Name the missing value in each of the proportions.

1. $\frac{2}{3} = \frac{?}{15}$ 3. $\frac{24}{18} = \frac{?}{6}$

2. $\frac{5}{7} = \frac{10}{?}$ 4. $\frac{72}{20} = \frac{18}{?}$

F-9 Write the proportion for each of the following and solve.

1. Sally does 8 sit-ups every 18 seconds. At the same rate, how many sit-ups can she do in 27 seconds?

2. For every 5 boxes of candy sold, the Little League makes $2 profit. How many boxes must they sell to make $100 profit?